AMERICAN JOURNAL OF ORTHODONTICS

OFFICIAL PUBLICATION OF
THE AMERICAN ASSCCIATION OF ORTHODONTISTS,
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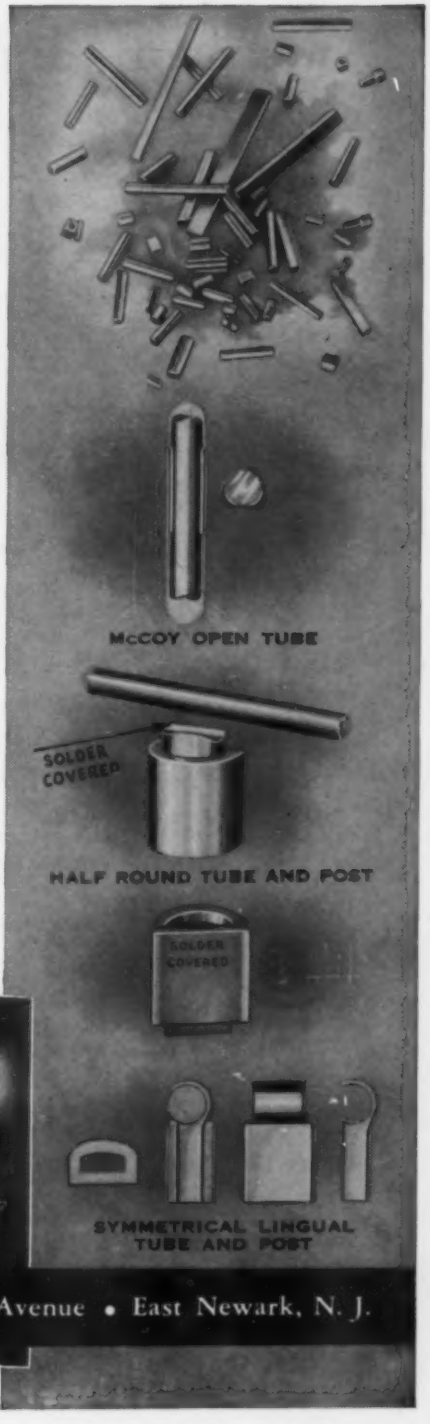

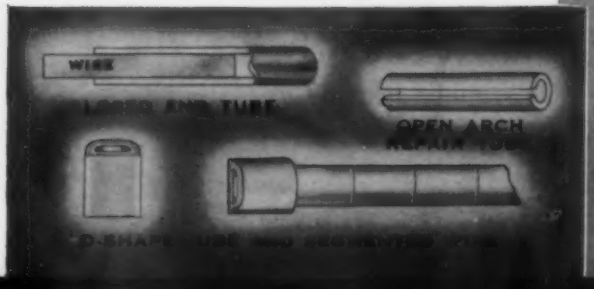

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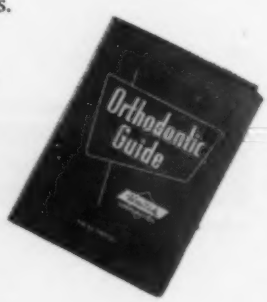

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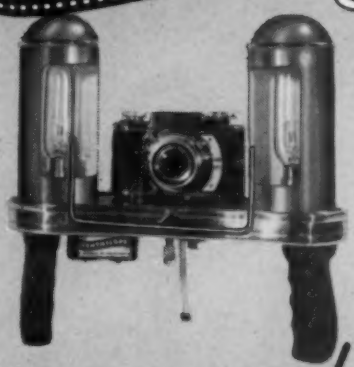

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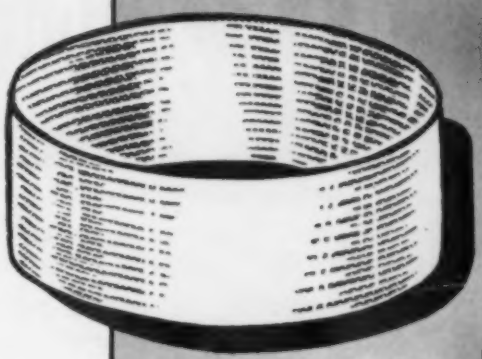

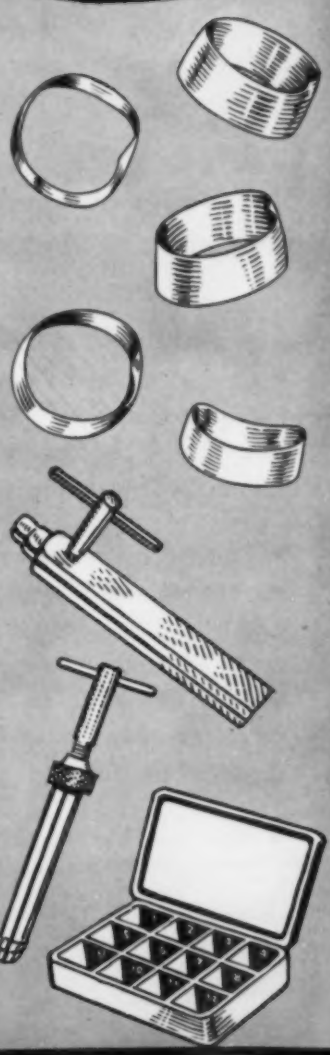

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• What kind of assistance does UNICEF give? It provides food for supplementary feeding; raw materials for the manufacture of clothing, blankets and shoes; services and equipment for baby clinics and child care institutions; medical supplies, transport, insecticides and sprayers for medical programs; and up-to-date training of pediatricians, nurses and child health workers.

• One of the most important phases of the health program is BCG (Bacillus Calmette Guerin) anti-tuberculosis vaccination campaign. The goal set for this campaign is the testing of 50 million children and the vaccination of all non-reactors. To date the campaign has reached 27 million children.

• Other diseases are being fought just as systematically. In India, for example, more than one death in three comes from malaria. So UNICEF has been supplying DDT to spray huge areas to stamp out this plague. In Italy, thousands of children and adults have been treated for the cure and prevention of venereal diseases. In China, classes have been held to teach rudimentary sanitation to midwives who in that land of few trained doctors have for centuries delivered the children of China.

• The slow, steady and unheralded progress of these UN health and child welfare programs are the positive side of the post war effort toward peace. Some of the money that has made it possible has come from government treasuries; more of it has been contributed by the people in many lands. To cite a few instances, voluntary citizens' campaigns have just been completed in Canada and the Dominican Republic and are now under way in New Zealand, Belgium, Austria, Italy, Yugoslavia and Australia. *People in the United States can do their part to aid in this world-wide humanitarian work by forwarding their contributions to the U. N. Children's Fund Committee, New York 16, New York.*

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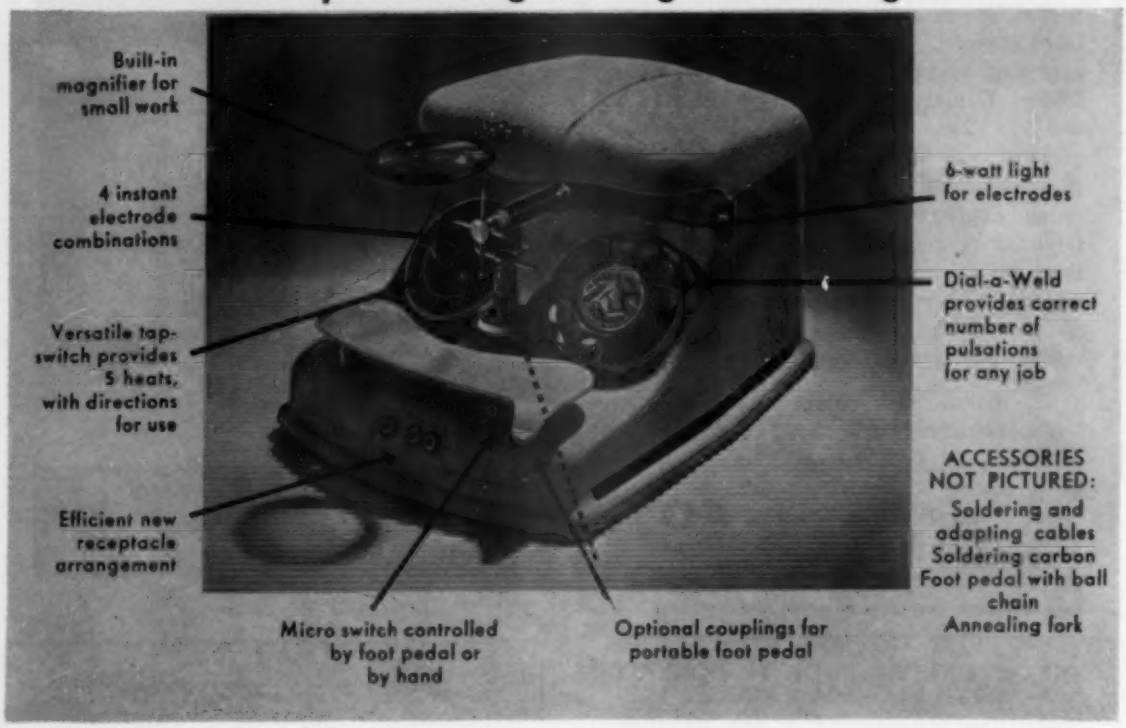
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VOL. 36 OCTOBER, 1950 NO. 10

Original Articles

THE DEVELOPMENT OF THE DENTITION OF MACACA MULATTA

ITS DIFFERENCE FROM THE HUMAN PATTERN*

LOUIS J. BAUME, D.M.D., AND HERMANN BECKS, M.D., D.D.S.,
SAN FRANCISCO, CALIF.

ANGLE'S[2] analysis and classification of dental occlusions and the subsequent efforts of Hellman,[14] Broadbent,[7] and Brodie[9] to unveil the developmental relationship between the face and the dentition trace historically the advancement of the science of orthodontics. With the introduction of anthropometric methods, the latter were able to reveal the morphogenetic pattern of the human head and dentition. On the other hand, concerted attempts were made by Gregory,[12] Hellman,[15] R. Schwarz,[27] Weidenreich,[36] and others to complete this understanding of individual or *ontogenetic* development by comparative studies on the general evolutionary trend of the human species in his *phylogeny*.

This study is an effort to elucidate the question of whether certain variations found in the ontogenetic development of the human dentition are the result of purely individual factors or should be attributed to phylogenetic evolution. In a survey on the development of the dentitions in 60 children,[3, 4] the occurrence of two morphologic types has been reported. The deciduous arches were either continuously spaced or continuously closed; no physiologic spacing was seen during the period of the primary dentition. Expansion of the dental arches in the anterior region to accommodate the larger permanent successors was ascertained by a lateral and forward growth of the alveolar process *during* the time of the eruption of these teeth. A high incidence of crowding in previously closed arches was noted. Measurements of forward extension upon the eruption of the permanent incisors showed a comparatively smaller average for the mandibular arches than the maxillary ones. This lessened

From the George Williams Hooper Foundation for Medical Research and the Division of Dental Medicine, College of Dentistry, University of California.

Aided by grants from the Regents of the University of California, the American Foundation for Dental Science, and the California State Dental Association.

*This paper was submitted for the essay contest of the American Association of Orthodontists (1950) and placed third.

forward growth was found to be responsible for a greater incidence of severe overbite in the mixed dentition. Three different mechanisms of occlusal molar adjustment were revealed. They depended again on the anatomical pattern of the deciduous dentition. The rare occurrence of a terminal plane forming a mesial step allowed the first permanent molars to erupt directly into proper occlusion; the presence of a mandibular space between the canine and first deciduous molars and a straight terminal plane was conducive to proper molar occlusion by means of an early mesial shift of the mandibular deciduous molars into this space. Closed deciduous arches and a straight terminal plane resulted in an end-to-end relationship of the first permanent molars which often failed to achieve proper interdigitation after loss of the second deciduous molars. This critical stage of the human dentition has been well recognized by Broadbent[8] and Schour and Massler,[25] who aptly termed it the "Ugly Duckling Stage." The obvious tendency of the cases with closed deciduous arches toward production of poor occlusion, as well as the result of deeper incisal overbite due to lack of mandibular forward growth, raises the question of whether this developmental pattern has to be assigned to a pathologic formation or a manifestation of a general phylogenetic evolution.

Little information is available on the individual developmental pattern of the dentition in precursors of modern man, since the palaeontological remains of children are very scarce and always fragmentary. It is supposed that a comparative study upon the dental development of related forms of the Hominidae in the suborder of Anthropoidea would provide some information on the direction of certain evolutionary changes in the human dentition. The character of this investigation, therefore, will be more of a comparative ontogenetic study than an odontographic one.* Such a report would have as its subheadings sequence of eruption and physiological changes in the dimensions of the arch during the development of occlusion.

Perusal of the literature offers data on the order of eruption of the teeth of the Great Apes by Selenka,[30] Keith,[19] and Zuckerman,[40] and of the whole series of Old World Apes (707 skulls) by Krogman.[20] The most complete study on the sequence of tooth eruption in Rhesus Macaques is presented by Schulz[26] with 419 skulls including observations on animals of known age. No records on ontogenetic changes of the dental arches, however, were made for any of the primate families.

MATERIAL AND METHOD

The subject of the present ontogenetic study is the dentition of Macaca mulatta.† Forty-one animals of a desired range of stages were available.‡ They all were born in freedom in India. Their exact ages are therefore un-

*Differences in tooth morphology of the Great Apes and morphogenesis of human teeth have been the subject of exhaustive reports by Adloff,[1] Gregory,[13] Hellman,[15] R. Schwarz,[27] Weidenreich,[36] et al. No reference, however, is made to the tooth forms of lower apes, with the exception of taxonomic reviews such as Widdowson's.[38]

†This species of Rhesus macaques ranks among the series of Catarrhini or Old World Monkeys with the family of Cercopithecidae which ascribes them the possession of a short tail. In the classification list of the order of Primates and suborder Anthropoidea, they range next to the family of Hylobatidae (Gibbons) followed by the family of Pongidae or Great Apes.

‡Through the courtesy of Dr. K. F. Meyer, Director of the George Williams Hooper Foundation for Medical Research.

known. Before the animals were killed they were subjected to a short immunologic test experiment. Immediately after the sacrifice in ether anesthesia by bleeding, the heads were placed in 10 per cent neutral formol for five days. Then roentgenograms were taken of the lateral aspect at a 4-foot target distance, the center ray passing the transmeatal axis. The roentgenograms served to determine the total profile angle. After ablation of lips and cheeks from the bottom of the oral cavity, front and profile photographs of the denture in occlusion were made. Thereupon the mandible was carefully removed from the skull and plaster reproductions taken of the maxillary and mandibular dental arches. Subsequent to a separation of the upper jaw from the brain case through the orbits, both dental arches were x-rayed horizontally and measured with the help of a micrometer gauge in the following dimensions:

a. The intercanine width (c-c) between the centers of the lingual cinguli at the gum margin. (Compare Fig. 1, *a*, distance *a*.)

b. The intermolar width (m_2-m_2) between the lingual grooves of the second deciduous molars at the gum margin. (Compare Fig. 1, *a*, distance *b*.)

c. The length of the frontal portion from the center of a thread connecting the two mesial surfaces of the deciduous first molars to the anterior point, infradentale. (See Fig. 1, *b*, distance *c*.)

d. The length of the mandibular deciduous arch or the perpendicular distance from a line connecting the two postlactea (distal m_2) to the infradentale. (Compare Fig. 1, *a*, distance *d*.)

Afterward both jaws were dissected in the median plane and each half roentgenographed from the lateral aspect at the same target distance of 4 feet, the center ray directed toward a supposed root center of the first permanent molar. The plates were evaluated metrically to determine the following dimensions:

e. The axial inclination of the lower central incisors or the angle formed by their axis with a line tangent to the lower border of the mandible. (See Fig. 3, *a*, angle *e*.)

f. The upper body height of the lower jaw measured from the dentinoenamel junction at the central occlusal pit of the lower second deciduous molar, perpendicular to the center of the mandibular canal. (Compare Fig. 3, *a*, distance *f*.)

g. The total body height of the lower jaw from the same landmark of the second deciduous molar and perpendicular to the lower mandibular border.

h. The ramus height taken from the top of the condyloid process, perpendicularly, to a line tangent to the lower border of the mandible. (Fig. 3, *a*, distance *h*.)

i. The total body length of the mandible measured horizontally between the infradentale and distal border of the ramus.

The jaws of 19 selected specimens were further dissected and prepared for histologic examination; the others were preserved in 10 per cent neutral solution of formol. Details of the histologic study will be reported in a subsequent paper.

In order to evaluate this collected material, it was necessary to tabulate chronologically the 41 dentitions of unknown age according to their developmental stage. The number of teeth present were recorded, as well as the developmental stages of the tooth buds, permitting the placement of the cases in a consecutive order. Four different periods defined by the following characteristic events may be distinguished:

The *first period,* represented by 7 specimens of consecutive stages, comprises the time interval between the appearance of the lower permanent first molars and the establishment of its occlusion with the upper permanent first molar. According to the Eruption Table of Schulz[26] this period would last from the twentieth to the twenty-fourth month of life.

The *second period,* as shown by 11 animals, is characterized by permanent first molars in function with all the deciduous teeth present. An interval of about ten months is calculated for this period as attested by the data of Schulz.

The *third period* covers the interval during which the deciduous incisors are replaced by the permanent ones. Fourteen specimens were in this period which Schulz dates from the thirtieth to the forty-second month of age.

The *fourth period* is initiated by the eruption of the permanent second molars followed by a rapid and simultaneous replacement of the deciduous molars by the premolars. This period is terminated after the eruption of the permanent canines, of which the upper canines appear last. According to Schulz it would extend from the forty-second to the fiftieth month of age. Nine cases belong to this developmental group.

The present material is devoid of representatives of an early period of the deciduous dentition and of the late period of a completed dentition with the third molars present.

FINDINGS

First Period: Deciduous Dentition and Eruption of the Permanent First Molars.—The shape of the deciduous dental arches of Macaca displays a remarkable uniformity in all the specimens studied. The mandibular arch can be described as U-shaped or parabolic, which is specific for anthropoids. The lower

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First Period

Fig. 1.—Plaster reproductions of the dentition of Specimen 14 at the first period when the first permanent molars are erupting.

a, The lower arch is U-shaped. Note the primate spaces and proximal contact of all the deciduous incisors. (*a*, Intercanine distance; *b*, intermolar distance; *d*, total arch length.)

b, The upper arch shows similar features. Note the wearing down of the upper incisors. (*c*, Anterior arch length.)

c, Note the slight overbite, the interlocking canines, and the terminal plane forming a mesial step of the deciduous dentition in occlusion.

d, The slight overjet and overbite is shown from below.

Fig. 2.—*a* and *b*, Oral photographs of Specimen 31 demonstrate a later stage; the incisal relationship consists of an end-to-end bite after progressed attrition of the crowns. Lips and cheeks are removed.

Fig. 3.—Roentgenograms of Specimen 10 present the earliest stage of the first period.

a, Left half of mandible. Note the developmental situation of the permanent tooth buds. The first permanent molar is piercing the gingiva. (*e*, Incisal inclination angle; *f*, upper body height; *h*, ramus height.)

b, Right half of the upper jaw. First permanent molar is below the gingiva.

c, Horizontal aspect of the mandible. Note the lingual position of the successional tooth germs.

d, Horizontal aspect of the upper jaw. Patent interpremaxillary suture is visible.

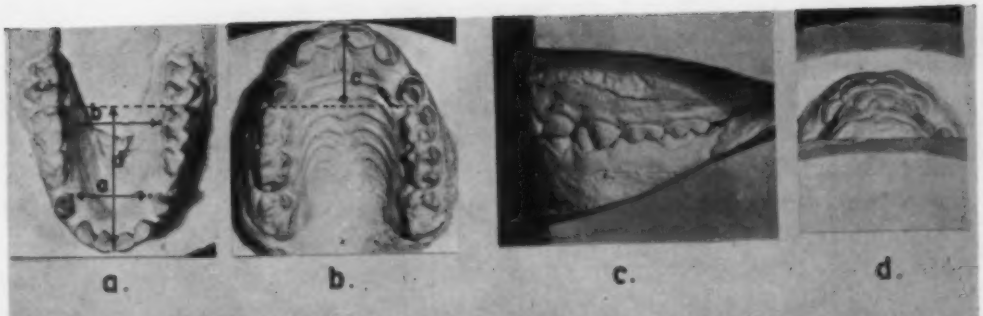

FIG. 1

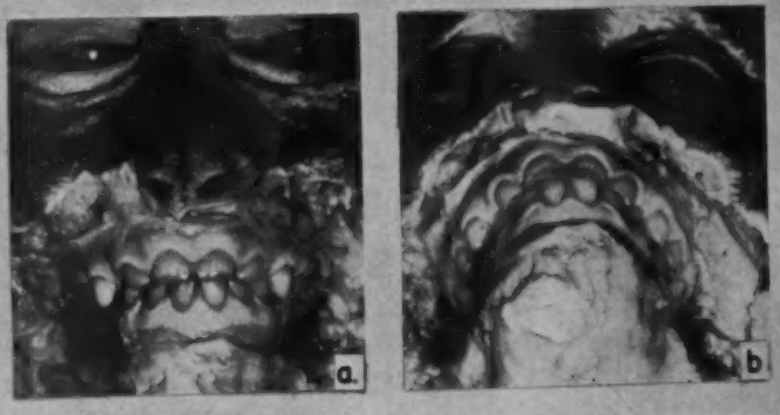

FIG. 2

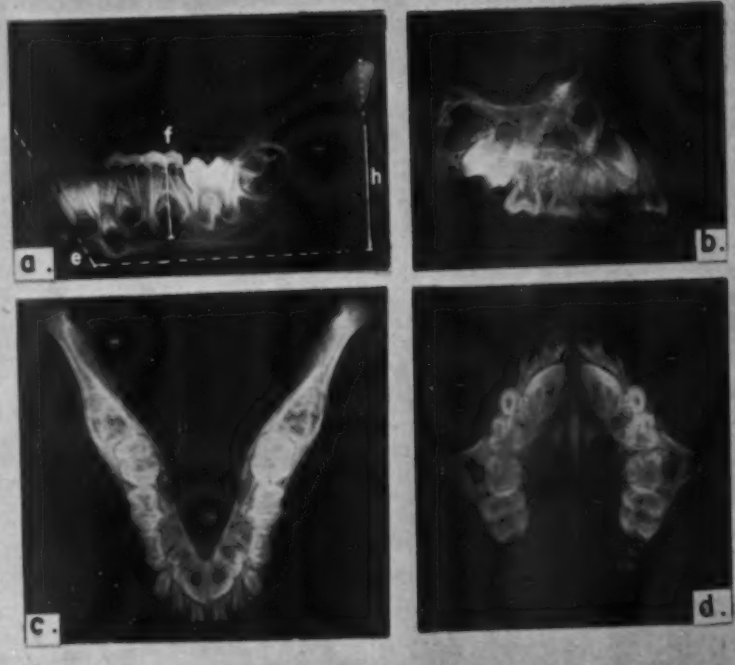

FIG. 3

Figs. 1, 2, and 3.—*(For legend, see opposite page.)*

TABLE I

MEAN VALUES OF ARCH AND JAW MEASUREMENTS AT DIFFERENT DEVELOPMENTAL PERIODS IN MM.

			MANDIBULAR ARCH				MANDIBLE						MAXILLARY ARCH			
PERIOD	VALUE	NO.	C-C	M_2-M_2	aL	L	INCL. ANGLE	$\frac{b}{2}$ H	BH	RH	BL	NO.	C-C	M_2-M_2	aL	PROFILE ANGLE
First	M	7	11.6	14.8	9.5	22.4	114°	12.8	16.3	29.8	49.9	7	16.1	16.8	12.0	67.8°
	σ		0.60	0.74	0.48	1.35	1.6°	0.72	0.79	1.79	2.95		0.67	0.97	0.78	1.93°
	ϵ		±0.22	±0.28	±0.180	±0.51	±0.60°	±0.27	±0.29	±0.67	±1.11		±0.25	±0.36	±0.29	±0.96°
Second	M	14	13.4	16.0	10.5	22.9	108°	15.1	18.8	33.0	57.5	11	17.6	19.1	13.3	63.3°
	σ		0.92	0.76	0.30	1.46	4.4°	0.71	1.0	2.1	3.74		1.2	1.4	1.1	1.2°
	ϵ		±0.24	±0.20	±0.08	±0.42	±1.22	±0.19	±0.26	±0.52	±0.99		±0.36	±0.42	±0.36	±0.40°
Third	M	11	13.6	15.8	11.5	23.0	125°	15.3	19.1	31.7	58.0	14	17.5	18.7	13.8	61.1°
	σ		0.37	0.48	1.04	2.04	3.6°	0.94	0.94	2.8	1.1		0.7	1.0	1.2	1.8°
	ϵ		±0.11	±0.14	±0.31	±0.61	±1.09	±0.28	±0.28	±0.84	±0.33		±0.18	±0.26	±0.32	±0.5°
Fourth	M	9*	15.3	17.0	12.0	24.8	128°	15.7	20.1	34.5	62.0	9	19.5	20.1	15.0	—
	σ		0.3	0.0	0.7	0.8	1.5	0.0	0.0	1.7	2.2		0.0	1.0	0.5	
	ϵ		±0.13	±0.0	±0.28	±0.32	±0.56	0.0	0.0	±0.64	±0.83		0.0	±0.44	±0.22	

c-c: intercanine width.
m_2-m_2: width between second deciduous molars.
aL: anterior arch length, incision-canine axis.
L: arch length, incision-m_2 axis.

$\frac{b}{2}$ H: upper body height, mandibular canal-m_2 surface.

BH: total body height, lower border-m_2 surface.
RH: ramus height, lower border-condylar head.
BL: body length, incision-distal border.
M: arithm. mean.

σ: standard deviation $\sqrt{\frac{\delta^2}{n-1}}$

ϵ: standard error $\frac{\sigma}{\sqrt{n}}$

*Arch measurements only between deciduous teeth. (Compare Table IV.)

anterior teeth are arranged roughly in a semicircle while the posterior teeth of both sides form two almost parallel rows (Fig. 1, *a*). The maxillary teeth are aligned similarly; the front teeth, however, are in a more elliptical form (Fig. 1, *b*). In the lower arch all deciduous teeth contact the neighboring proximal teeth with the exception of the canines. Between the lateral deciduous incisors and canines there exists regularly on both sides a 1.2 mm. wide diastema. Another narrower space of about 0.5 mm. width is found in most of the cases distal to the canines. The upper arch consistently exhibits a spacing of about 2 mm. between the second deciduous incisors and canines of both sides with all the other deciduous teeth in contact. These described diastemata are well known as "ape or primate spaces."

The dimensions of the arches as measured directly on the specimens and checked on the plaster reproductions are given in Table I. Data show very low standard deviations in spite of the small number of specimens, even of different sex.

The characteristic features of the occlusal relationship of both deciduous arches consist of interlocking canines, terminal planes forming a mesial step, and a very slight incisal overbite. The biting surfaces of the deciduous teeth except for the canines are situated in a parabolic plane inclined inside upward, outside downward. This allows the lower arch to function in a manner comparable to a pestle in a mortar. There is, however, little freeway for lateral movement due to the occlusal arrangement of the deciduous canines. The lower canines are directly accommodated into the upper primate spaces. The upper canines in return interlock somewhat labially into V-shaped spaces formed by the distal of the lower canine and mesial of the first deciduous molar. Thus attritional wear tends to keep the deciduous cuspids sharp and pointed during the whole functional period (Fig. 1, *c*).

At the terminal end of the primary denture the upper second deciduous molars regularly overlap the lower ones. This causes the distal surfaces to form a mesial step, which is due to a nearly equal mesiodistal diameter of the upper and lower deciduous molars.

Examination of the incisal relationship discloses a slight overbite in the youngest specimens on hand (Fig. 1, *d*). With the progressively older cases, an end-to-end bite of the incisors is observed. The decreasing coronal length of the upper incisors shows that there is a progressive wearing down of the crowns in the form of a bevel inclined to the lingual (Fig. 2, *a*).

All the teeth of the upper arch jet over the lower ones; the upper canines being the most prominent (Fig. 2, *b*). This is reflected somewhat in the amounts of difference between the upper and lower intercanine width (4.5 mm.) as compared to 2 mm. between the upper and lower intermolar distances in Table I.

The angle of inclination of the lower incisor axis, by 114°, signifies the clinostatic position of the deciduous incisors. Roentgenograms in Fig. 3, *a-d* demonstrate that little resorption of their root has occurred. It also can be seen that in the mandible the crowns of the premolars and the second molar begin to be mineralized whereas in the maxilla the premolar germs are not yet visible.

All these morphologic features have a distinct bearing upon the further development of the dentition. This first becomes apparent in the survey on the occlusal adjustment of the erupting permanent first molars. The lowers are always the first to erupt; the uppers appear when the antagonists have reached the occlusal plane (Fig. 3, *a* and *b*). They are guided directly into proper interdigitation by the distal surfaces of the opposing second deciduous molars, which were described previously as forming a mesial step. This event terminates the first period studied.

Second Period: Function of the First Permanent Molars in Arches With All the Deciduous Teeth Present.—Two developmental processes indicate that there exists a time interval after the eruption of the accessional permanent first molars until the replacement of the successional first permanent incisors, hence justifying the establishment of a new period.

One process consists of the completion of root formation of the first permanent molars while all the deciduous incisors are present. X-rays show that the roots of the mandibular permanent first molars are formed about three-fourth of their definitive length and of the upper ones, about one-half when their crowns begin to contact in occlusion. Thus the terminal portions of these roots are built under the continuous influence of occlusal stresses. The roentgenograms reveal that at the end of this growth process the deciduous incisors in the front are still present.

Another definite developmental change pertains to the positioning of the front teeth. In all the dentitions studied whose arches consisted of all the deciduous teeth with the permanent first molars in function, the deciduous incisors have clearly separated interproximally. A *physiologic spacing* as demonstrated in Fig. 4, *a-c* and Fig. 5, *A-C* has occurred. The mechanism of spacing can easily be studied with the help of biometry and roentgenograms. Measurements of the 14 cases of the second period in Table I show increased dimensions in both arches. The differences between the data of the first and second periods are presented in the upper row of Table II. They indicate that the anterior portion of both arches is about 1.5 mm. larger between the canines (c-c) and 1.0 mm. longer (aL). The intermolar dimensions are also enlarged; the greater increment in the maxillary intermolar width by 2.3 mm. over the mandibular (1.2 mm.) becomes visible in a transition of the upper parabolic arch form into an

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Second Period

Fig. 4.—Plaster reproductions of the dentition of Specimen 8 at the second period when the permanent first molars are in occlusion and a spacing of the deciduous incisors has taken place.

a, The lower arch has increased in transverse and sagittal dimensions which resulted anteriorly in a spreading of the deciduous incisors.

b, The upper arch now shows an elliptic form. Note heavy attrition of all the deciduous teeth and the rotation of the permanent molars.

c, Proper interdigitation of the permanent first molars and decrease in dental height can be seen in the dentition in occlusion.

Fig. 5.—Oral photographs showing consecutive stages of the second period.

A, Specimen 33 displays spacing and attrition of the deciduous incisors.

B and *C*. The beginning of a gingival recession and the end-to-end bite of the deciduous incisors is demonstrated with Specimen 32.

Fig. 6.—The roentgenogram of the horizontal aspect of the mandible of Specimen 7 shows the position of the succeeding permanent teeth at the second period.

Fig. 7.—The roentgenograms of the sagittal aspect of the jaws of Specimen 15 illustrate the course of the root resorption of the central deciduous incisors and the developmental stages of the tooth germs.

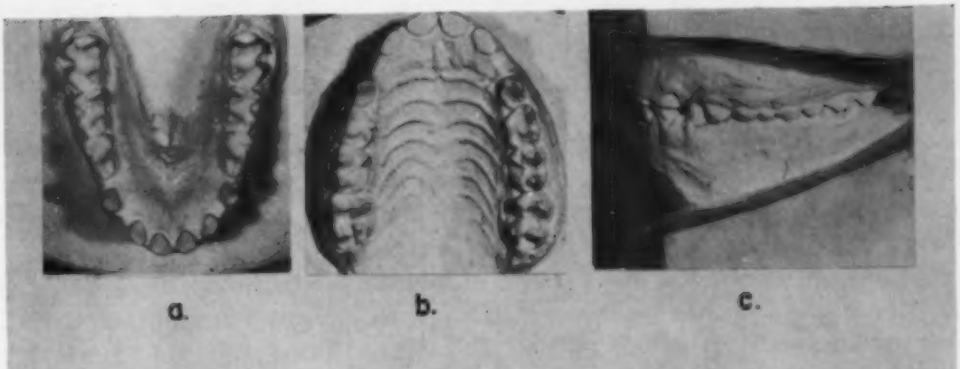

FIG. 4

FIG. 5

FIG. 6

FIG. 7

Figs. 4, 5, 6, and 7.—(*For legend, see opposite page.*)

TABLE II. DIFFERENCES BETWEEN THE VALUES OF ARCH AND JAW MEASUREMENTS OF SUCCEEDING PERIODS

INTERVAL		MANDIBULAR ARCH				MANDIBLE					MAXILLARY ARCH			TOTAL PROFILE ANGLE
		C-C	M_2-M_2	aL	L	INCL. ANGLE	$\frac{b}{2}$ H	BH	RH	BL	C-C	M_2-M_2	aL	
First-Second period	M	+1.8	+1.2	+1.0	+0.5	−6°	+2.3	+2.5	+3.2	+7.6	+1.5	+2.3	+1.3	−4.5°
Second-Third period	M	+0.2	−0.2	+1.0	+0.1	+17°	+0.2	+0.3	−1.3	+0.5	−0.1	−0.4	+0.5	−2.2°
Third-Fourth period	M	+1.7	+1.2	+0.5	+1.8	+3°	+0.4	+1.0	+2.8	+4.0	+2.0	+1.4	+1.2	- -
First-Fourth period	M	+3.7	+2.2	+2.5	+2.4	+14°	+2.9	+3.8	+4.7	+12.1	+3.4	+3.3	+3.0	- -

For legend, see Table I.

elliptic one with the intermolar distance m_2-m_2 as its short axis. Spacing of the upper front teeth appears more as an enlargement of the primate space than as an even distribution of the spaces between each incisor. The latter is the pattern of the spreading of the lower incisors.

Roentgenograms permit an excellent insight into this spacing process. It starts in the mandibular arch at the beginning of root formation of the first permanent incisors when their incisal edges have approached within 1 mm. of the bone surface. One may compare Fig. 6 with Fig. 3. The lingually erupting incisors partly initiate a resorption of the roots of their predecessors, but only of their lingual aspect, and partly move them mesially (Fig. 7). The displacement of the lower deciduous incisors, however, does not proceed strictly parallel to their former long axis, since the angle of this axis formed with the lower border of the mandible has decreased from an average of 114° to a more orthostatic one of 108°. The tips migrate further than the coronal portions. This affects the incisal relationship which exhibits now a strict end-to-end bite without any overjet. The upper incisors are worn down lingually almost to the gingival margin. Contrary to this decrement in dental height, measurements between the occlusal surface of the second deciduous molar to the lower border of the mandible (BH), as well as to the mandibular canal ($\frac{b}{2}$H), show higher values in the cases of the second period. Since this increment noted in Table II for both distances is nearly the same, it must be credited to a vertical growth at the alveolar crest and not at the lower border of the mandible.

The more prognathous total profile angle by 4.5° among the cases of this second period and the spectacular increase in mandibular body length (BL) by 7.6 mm. indicate the forward development of the whole masticatory apparatus from the cranial base. The increment of the anterior arch length (aL) by 1.3, however, suggests that the process of spacing is only to a minor part related with this development of a simian prognathism.

Third Period: Replacement of the Incisors.—The eruption sequence of the permanent incisors for the cases studied is listed in Table III. In three specimens the upper central incisor was seen to be the first to appear; only in one instance did the lower precede the upper. The eruption was observed to be simultaneous and the occlusal plane would have been reached at the same time by both the upper and lower permanent central incisors in six instances. The lateral mandibular incisors are the next teeth to be replaced. The maxillary homologues are retained for the longest period, and their eruption time often overlaps the next period of the accession of the permanent second molars. It was observed that the ape spaces found in the deciduous dentition remain with the replacement of the lateral incisors.

Three typical features merit special description, namely, the type of replacement of the incisors, its relation to bone growth, and the development of the incisal relationship.

It is a rather striking fact that among the 14 cases of this period none was found with a fully empty space due to the shedding of a temporary incisor.

To the contrary, two cases exhibit both incisors present at the same time, the deciduous and the permanent one. Such instances are presented in Figs. 8 and 9. Searching for an adequate explanation, it can be observed in the roentgenograms that the labial portion of the first deciduous incisors never is resorbed completely even though the top of the successor already has broken through the bone or even the gum. In conformity with this observation in all the cases in which only the incisor of one side is replaced, the deciduous homologue of the other side shows a marked retraction of the gingival border exposing the whole root surface (Fig. 10). This may be spoken of as the physiologic status imminent to exfoliation. The type of such a replacement process can be called a horizontal type rather than vertical, which would proceed along a more perpendicular direction.

The growth of the supporting bone seems to be stunted during this third period. This is concluded from the data of measurements in Table I and their differences from those of the second period noted in the second row of Table II. With the exception of somewhat increased sagittal measurements of the arches, no significant changes in any of the other dimensions are revealed. Only the angulation of the lower incisor axis is altered by plus 17°. This indicates that the axial inclinations of the permanent lower incisors are less upright than those of their predecessors.

The occlusal relationship of the permanent incisors proves to be consistently an end-to-end bite from the very beginning. Its mechanism can be understood in the light of the above findings. The horizontal type of replacement which consists of a forward displacement of the deciduous incisors concomitantly with the lingual eruption of the permanent successors, as well as the latter's greater axial inclination, drives the primarily erupting permanent teeth automatically into an edge-to-edge contact with the antagonist. When the upper permanent central incisor is the first to erupt, as shown in Fig. 10, then it is the presence of the forward migrated lower deciduous opponent which prevents the formation of an overjet. Horizontal overjet is the prerequisite of any degree of vertical overbite. The reverse situation holds true in Fig. 11 where the lower central incisor was the first to be replaced. There is convincing evidence that the almost equal forward movement of the erupting lower permanent incisors to the upper permanent incisors (aL in Table II) is responsible for the achievement of an end-to-end occlusion. The simulta-

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Third Period

Fig. 8.—Plaster reproductions of lower and upper dental arches of Specimen 6 at the third period. Note the lingual eruption of the mandibular left permanent lateral incisor.

Fig. 9.—Roentgenographic aspect of the left mandibular half of the male Specimen 12 to demonstrate the horizontal type of replacement of the lower incisor. Note the masculine developmental order of the tooth germs: M_2, P_1, P_2, C.

Fig. 10.—Oral photograph of Specimen 34 showing the exfoliating mode of the upper deciduous central incisor. Note the recession of the gingiva and the disappearance of a subnasal alveolar height. Eruption of the upper permanent incisors before the lower permanent incisors is not unusual.

Fig. 11.—The roentgenographic headplate of Specimen 22 illustrates the maintenance of an end-to-end relationship between the upper deciduous incisors and the lower replaced homologues through adequate mandibular forward development. Note absence of pneumatic cavities and hyperprognathous profile angle of 59°.

Fig. 12.—Oral aspect of a dentition at the end of the third period when all the permanent incisors have erupted into end-to-end occlusion (Specimen 25).

Fig. 13.—Roentgenologic and photographic records of the dentition of Specimen 28 which displays a deep incisal overbite due to the lack of mandibular forward development subsequent to an accident.

FIG. 8

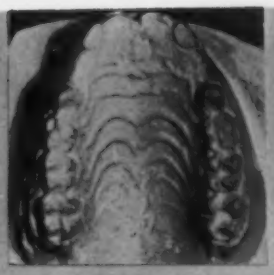

FIG. 9

FIG. 10

FIG. 11

FIG. 12

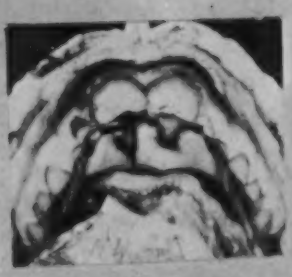

FIG. 13

Figs. 8, 9, 10, 11, 12, and 13.—(*For legend, see opposite page.*)

neously negative data of measurements in height ($\frac{b}{2}$H, BH, RH) between the second and third period noted in the second row of Table II indicate that no vertical bone growth, whether of the alveolar process or mandibular ramus, is related with the development of that kind of incisal relationship. Neither has it anything to do with true increase in dental height. Such is indeed the superficial impression gained from the aspect of the longer permanent incisor crowns. Scrutiny, however, reveals that the exposure of the lingual coronal surfaces of the upper and lower permanent incisors is only partly due to an active eruption of these teeth, but for the most part to a recession of the gingival crest to the level of the cementoenamel junction. As soon as a permanent incisor has established occlusal contact, then at least the fast phase of active eruption ceases. The horizontal type of exfoliation has above been shown to initiate the passive eruption process. Photographs shown in Fig. 12 clearly demonstrate the decreased distance between the nasal floor and gingival crest of the upper permanent incisors when compared with cases of deciduous incisors, presented in Fig. 5. Similar findings are gained in the mandible. The gingival crest of the lower permanent incisors is nearer the gnathion than it is in instances when the deciduous incisors are present.

Specimen 28 (Fig. 13) illustrates, as an experiment of Nature, what happens when the upper permanent incisors appear first and the lower deciduous incisors have been lost for a long time by accident. Since the descent of the upper permanent central incisors was not stopped by the lower antagonists, they erupted actively further occlusally than normal; this in turn prevented the forward movement of the later erupting lower homologues. A distinct overbite with overjet has developed exactly comparable with the human pattern.

Fourth Period: Eruption of the Permanent Second Molars, First and Second Premolars, and Permanent Canines.—The examination of the small group of 9 specimens recorded in Table IV has been supplemented by 6 additional skulls previously prepared. In addition to this the roentgenograms of the 14 specimens of the preceding period have been checked in regard to the developmental stage of the premolars and second permanent molars as determined by their positional relationship to the oral surface. The result was found to be uniform. The mandibular permanent second molars always are the most advanced and are the first to pierce the gingiva. They are shortly followed by the maxillary opponents (Fig. 14). In the mandible they are arranged in a

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Fourth Period

Fig. 14.—Photograph of Skull III showing the dental development at the beginning of the fourth period when the second permanent molars erupt. Note anteriorly the close relationship between alveolar crest of the upper permanent first incisor and the nasal floor (NF). Note the premaxillary suture.

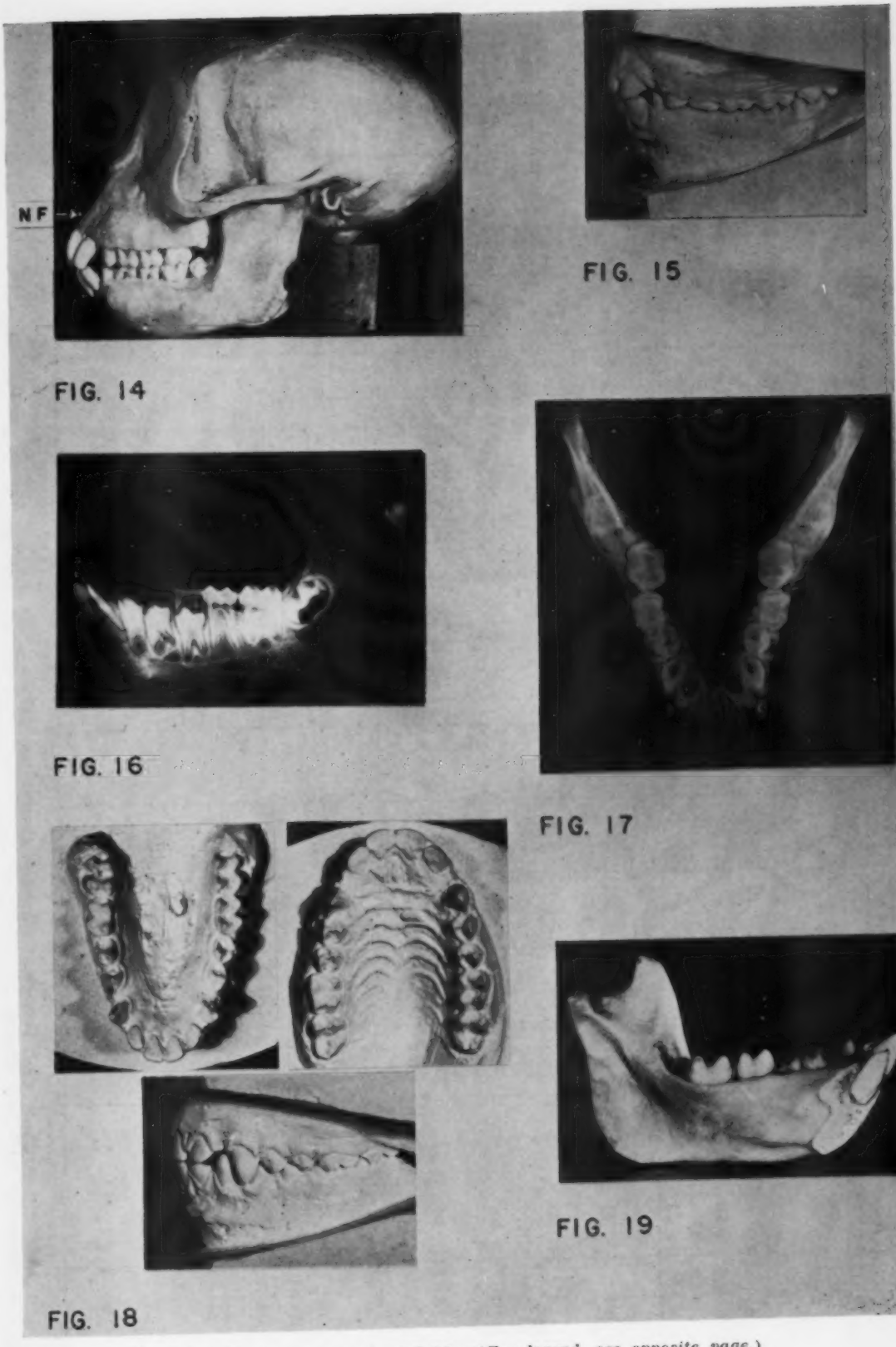
Fig. 15.—Plaster reproduction of Specimen 13 with the second permanent molar in occlusion and all the deciduous canines and molars still present.

Fig. 16.—Eruption stage of the permanent canines and premolars of the female Specimen 39 as seen in the roentgenographed right half of the mandible.

Fig. 17.—The roentgenogram of the mandible of the male Specimen 5 taken from the horizontal aspect reveals the linguoposition of the germs of the succeeding mandibular teeth.

Fig. 18.—Plaster reproductions of the dentition of the female Specimen 41 with almost fully erupted successional teeth. Note the similar distribution of diastemata as in the deciduous arches.

Fig. 19.—Photograph of the left mandibular half of Skull IV demonstrates the pronounced clinostatic relationship of the lower central incisor to the chinless anterior portion of the mandible.



Figs. 14, 15, 16, 17, 18, and 19.—*(For legend, see opposite page.)*

TABLE III. ERUPTION STAGE OF SPECIMENS AT THE THIRD PERIOD

NO.	SPECIMEN	FIRST PERM. MOLAR				CENTRAL INCISOR				LATERAL INCISOR				DENTAL FORMULA	
		LOWER		UPPER		LOWER		UPPER		LOWER		UPPER			
		R.	L.	R.	L.	R.	L.	R.	L.	R.	L.	R.	L.		
1	24	+	+	+	+	*	*	1/3	*	*	*	*	*	6V-II 1	I-V6
														6V-I	I-V6
2	34	+	+	+	+	*	*	*	½	*	*	*	*	6V-I	1 II-V6
														6V-I	I-V6
3	23	+	+	+	+	*	*	+	*	*	*	*	*	6V-II 1	I-V6
														6V- I	I-V6
4	22	+	+	+	+	1/3	o	*	*	o	o	*	*	6V-I	I-V6
														6V-III 1	1 III-V6
5	30	+	+	+	+	+	+	1/3	*	o	*	*	*	6V-II 1	I-V6
														6V-III 1	1 II-V6
6	18	+	+	+	+	1/3	o	1/3	1/3	*	*	*	*	6V-II 1	1 II-V6
														6V-II 1	II-V6
7	38	+	+	+	+	+	+	1/3	1/3	o	*1/2	*	*	6V-II 1	1 III-V6
														6V-III 1	12 II-V6
8	36	+	+	+	+	+	+	1/3	1/3	o	*	*	*	6V-II 1	1 II-V6
														6V-II 1	1 II-V6
9	27	+	+	+	+	+	+	1/3	1/2	*	*	*	*	6V-II 1	1 II-V6
														6V-II 1	1 II-V6
10	28	+	+	+	+	1/2	1/2	+	+	*	*	*	*	6V-II 1	1 II-V6
														6V-II 1	1 II-V6
11	6	+	+	+	+	+	+	1/3	1/3	*1/3	*1/3	*	*	6V-II 1	1 II-V6
														6V-III 21	12 II-V6
12	26	+	+	+	+	+	+	+	+	1/3	1/3	*	*	6V-II 1	1 II-V6
														6V-III 1	12III-V6
13	11	+	+	+	+	+	+	+	+	1/3	1/2	*	1/2	6V-II 1	12 III-V6
														6V-III 21	12 III-V6
14	9	+	+	+	+	+	+	+	+	+	+	*	*	6V-II 1	1 II-V6
														6V-III 21	12 III-V6

*: deciduous precursor in occlusion.
o: deciduous precursor shed, permanent successor piercing the gum.
½: permanent tooth half erupted.
+: permanent tooth in occlusion.

TABLE IV. ERUPTION STAGE OF SPECIMENS AT THE FOURTH PERIOD

NO.	SPECIMEN	SECOND PERM. MOLAR				CANINE				FIRST PREMOLAR				SECOND PREMOLAR				SEX
		LOWER		UPPER		LOWER		UPPER		LOWER		UPPER		LOWER		UPPER		
		R.	L.	R.	L.	R.	L.	R.	L.	R.	L.	R.	L.	R.	L.	R.	L.	
1	16	1/3	1/3	–	–	*	*	*	*	*	*	*	*	*	*	*	*	M.
2	25	1/2	1/2	–	–	*	*	*	*	*	*	*	*	*	*	*	*	F.
3	19	3/4	3/4	1/3	1/3	*	*	*	*	*	*	*	*	*	*	*	*	M.
4	5	+	+	1/2	1/2	*	*	*	*	*	*	*	*	*	*	*	*	M.
5	13	+	+	+	+	*	*	*	*	*	*	*	*	*	*	*	*	M.
6	39	+	+	1/2	1/2	°	1/2	*	*	*	°	*	*	*	*	*	*	F.
Skull	I	+	+	+	+	*	*	*	*	*	*	*	*	*	*	*	*	F.
Skull	II	+	+	+	+	*	*	*	*	*	*	*	*	*	*	*	*	M.
Skull	III	+	+	+	+	*	*	*	*	*	*	*	*	*	*	*	*	F.
7	3	+	+	+	+	°	1/3	*	*	°	1/3	+	+	+	+	+	+	M.
8	4	+	+	+	+	3/4	3/4	°	1/3	1/3	1/3	1/2	+	1/2	1/3	+	1/2	F.
Skull	IV	+	+	–	–	1/2	1/2	–	–	1/3	1/3	–	–	1/3	*	–	–	F.
9	41	+	+	+	+	+	+	3/4	3/4	1/2	1/2	+	+	+	+	+	+	F.
Skull	V	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	M.
Skull	VI	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	F.

For legend, see Table III.

straight line, in the maxilla, in a manner which accentuates the slight elliptic form of the upper arch. Their proper cuspal interdigitation is established immediately (Fig. 15). This is induced by the anatomical configuration of the terminal surfaces of the opposing first permanent molars which form a mesial step. At that time all the deciduous molars are still in function even though heavily attrited. Inspection of the roentgenograms, as well as the dried skulls, at this stage discloses that the root resorption is limited to about the apical third of the second deciduous molars and canines, and to about half of the first deciduous molars. A pause of varying duration now occurs before the deciduous molars and canines are replaced in a very rapid sequence. This last phase, however, is not fully covered with the present material. According to the roentgeno grams, the first mandibular premolars show a more advanced position than the maxillary ones. The clinical eruption of the second premolars and canines may proceed in a more coincidental order. This is dependent on which one of the deciduous teeth is shed first (Fig. 16). The x-rays show that the horizontal type of replacement prevails also among these successional teeth, very distinctly in the lower arch (Fig. 17), less so for the upper canines, first and second premolars. The latter erupt in a strictly vertical direction. It has to be pointed out here that there exists a very distinct sex-linked difference in the anatomy of the canine in Macaca mulatta. The males have very long and large canines, whereas the females possess shorter and more slender ones; the latter erupt in a shorter time and apparently somewhat earlier. This was clearly established by Schulz[26] with numerous observations on skulls. Fig. 18 presents the permanent set of a female specimen before the eruption of the third molars.

Measurements taken of the dental arches and of the mandibles at the fourth period can be seen in Table I. The standard errors, especially for the arch measurements, are minute, which expresses again the uniformity of the pattern. Data of Table II suggest in the third row the increase in dimensions between the third and fourth periods. The intercanine distance has widened appreciably, which is also detectable in an occasional spacing of the upper and lower incisors prior to the eruption of the permanent canines. The distance between the deciduous second molars shows somewhat less widening. In the upper arch there is, however, a flattening of the elliptic form due to a slight buccal rotation of the distal of the first molars. A greater forward development in the maxillary arch makes up for its arrest during the preceding interval. An increase in mandibular height (BH) by plus 1 mm. seems to be due to bone apposition at the lower border and not at the alveolar surface since $\frac{b}{2}$ H increased only .04 mm. This lack of alveolar development is very characteristic for the anterior portions of the jaws. The subnasal alveolar height seen in earlier periods has disappeared. The permanent upper central incisors are embedded into the bones bordering the external nasal aperture, which are the two premaxillae (Fig. 14). The roots are short and curved; one-half of the labial surface of the entire tooth and only about one-third of the lingual surface are covered with enamel. The premaxillary sutures at the eruption time of the premolars are still patent.

The relation of the lower incisors and their alveolar process to the supporting mandibular body is best demonstrated with a median section (Fig. 19). The roots of the lower incisors are straight and slender with the labial surface shorter than the lingual. The configuration of the cementoenamel junction is similar to that found in the upper incisors. The front portion of the alveolar process has a much wider curvature than the "supporting basal bone," which creates the ageneiotic or chinless mandible.

DISCUSSION

The human dentition concurring with Hellman[16] represents the responding organ to such a multitude of factors that "individual variation" characterizes its morphogenetic pattern. Steadily improving attempts have been made to delineate this ground plan initially by assessing variability by statistical means. Finally Broadbent[8] and Brodie[9] eliminated variety and studied the growth pattern of the same living individual throughout the developmental period. The revelation of certain types with the same basic conformation was the sequel to this recent assault.

Analysis of these types by method of comparative physiology will further the understanding of the morphogenesis of the dentition. For this purpose a search is made for significant differences between the above-studied pattern of Macaca mulatta and that of the human dentition as reported recently.[3, 4]

At first glance a very important characteristic of the morphogenetic pattern of Rhesus macaque is perceptible. That is its uniformity and consistency. Uniform is the morphology of teeth, arch form, occlusion, and dentofacial relation in the variety of specimens. Consistent is the sequence of their developmental changes with only a limited individual deviation in the eruption order of the premolar tooth group. These items shall be dealt with in chronological order.

The fully formed deciduous dentition of Macaca reveals only one type of tooth arrangement without appreciable variations. It is characterized through the distinct distribution of diastemata which are known as primate spaces. They permit an interlocking occlusion of the opposing canines. With the exception of the latter, all the other teeth of the arch are in proximal contact. In the human deciduous dentition at least two basic types with innumerable varieties are found, namely, either *spaced* arches with interproximally separated deciduous teeth, or *closed* arches with all the deciduous teeth in contact.[3]

Among the spaced human types, instances with a very similar arrangement of diastemata and occlusion of the canines can be observed. Without any doubt they disclose a primitive and possibly the original pattern. The completely closed type does not occur in any of the anthropoid families except for man. It may be added, however, that the ape spaces in the primary dentition of Chimpanzee, as well as Orang, due to larger deciduous incisors, are narrower than in Rhesus macaque.[30, 38]

Uniformity of dental pattern in Macaca also refers to the incisal relationship. This cannot be claimed for the human deciduous dentitions which display in this respect even a pathologic range of variations.

The same holds true for the terminal plane of the primary dentition so important to the occlusal adjustment of the first permanent molars. Due to equal mesiodistal dimensions of the opposing deciduous molars, their distal surfaces always form in Macaca mulatta a mesial step. In man this configuration is seldom found primarily; the average exhibits a straight terminal plane. The reason may lie in an evolutionary reduction of the mesiodistal width of the upper second deciduous molar. Many inadequate conformations, however, may rather constitute the accidental result of the hybridization of the human races through centuries (Hooton[18]). This certainly is obvious from the high standard deviations of the arch dimensions noted in children of even relatively homogeneous population groups (Lundström,[22] and Seipel[29]). In comparison to them the range of variation recorded in Macaca is really negligible. Considering that the animal group studied was subjected to highly different environmental influences as to diet, transport, and experimental means, the resulting uniformity of their arch dimensions is truly astonishing. This fact sheds some light upon the dominating role of heredity in the determination of the growth pattern of the dentition. The supporting bone structures may respond faster to environmental factors. This is suggested by the bigger variation noted in the direct measurements of the ramus height, mandibular length, and profile angle. Significant differences in body length in animals of the same sex and developmental stage also were reported by Schulz.[26]

Though not adequately covered with biometrical data, it can be stated that the craniofacial complex in Macaca undergoes ontogenetically changes in proportion which are not in concurrence with the findings of Brodie[9] in human samples. This is indicated in Macaca by the observation of the enhancing profile angle with increasing age, and the changed inclination of the permanent lower incisor when compared with the deciduous predecessors. It is also supported by the disappearance of the subnasal alveolar height after the second period. The anterior portion of the upper jaw grows mainly in the premaxillary sutures, as has been demonstrated by Moore[24] in his vital staining experiment. This brings about a strong forward development which is expressed by the increasing hyperorthognathous profile angle. Even in fossil man this degree of angulation never was reached.[41] The premaxillary sutures close in man during fetal life and the maxillae develop more in a vertical direction, which gives rise to the development of the typical human pneumatic cavities, the maxillary sinuses, and to the maintenance of a subnasal alveolar height also in adolescents.

In searching for a general definition of the disparities in the developmental pattern between the dentition of Macaca and man, it may be expressed as follows:

There is a relative retardation in eruption time of the accessional teeth and a relative acceleration of the eruption of successional teeth† in man when compared with the sequence in Macaca mulatta and higher Anthropomorphae.*

This is already evident during the first period of the dental development of Macaca. It showed a complete eruption of the permanent first molars posterior

*Accessional teeth are the 12 permanent molars.
†Successional teeth replace the 20 deciduous precursors.

to a consistently unchanged deciduous dentition. A pause intervened between the eruption of the permanent first molars and the permanent incisors, during which the spacing of the deciduous incisors and an extension of both arches occurred; it was designated as the second period. The replacement of the incisors occurred in the third period.

In order to compare this eruption sequence of the permanent first molars and permanent central incisors with that of man, the reliable data of Hellman[17] may be quoted:

	First Permanent Molar	*First Permanent Incisor*
Socially progressive group	♂ 6.77 years ± 0.75 ♀ 6.39 years ± 0.86	♂ 6.48 years ± 0.84 ♀ 6.05 years ± 0.75
Socially lower group	♂ 6.50 years ± 0.73 ♀ 6.23 years ± 1.03	♂ 6.77 years ± 0.86 ♀ 6.48 years ± 0.99

This table clearly demonstrates that in the progressive human group the permanent successional teeth precede the accessional relatively and absolutely in the eruption time. In the poor group the permanent lower central molars appear first but are followed in two months by the permanent first incisors. Thus a developmental phase equal to the second period in Macaca is only rudimentary in man. It consists of the short time interval between the eruption of the lower permanent incisor and the upper ones, when the occasional occurrence of a spacing in the upper deciduous front teeth has been described.[4] Therefore, the question arises, "When do the necessary changes in the human lower arch take place to accommodate the larger permanent incisors?" The answer was given with data of measurements which indicated considerable enlargement of the arches during the eruption of the permanent incisors.[4] During the analogous third period of Macaca no changes in the arch dimensions were found; enough forward and lateral extension of the arches had taken place in the previous second period. Therefore, it can be concluded that in man the accommodating changes in the arches are at least delayed if not reduced mainly in previously closed arches. There are, however, some indications which suggest that these changes could be partly anticipated in accordance with the acceleration of the successional dentition. This alludes to the instances of human deciduous dentitions which have all the deciduous anterior teeth spaced from the time of their eruption. This pattern does not occur in Macaca, as shown previously, at this early stage.

The same phenomenon of an accelerated eruption sequence of the successional teeth in relation to a retarded appearance of the accessional permanent molars in human beings becomes apparent in the final developmental stage of the dentition. According to the time table of Hellman,[17] the eruption order of the permanent canines, premolars, and second molars averages as follows:

Progressive Group	Upper Jaw	4	3	5	7	Poor Group	Upper Jaw	4	5	3	7
		X	↑	↘↑	↘↑			X	↑	↘↑	↑
	Lower Jaw	3→4		5	7		Lower Jaw	3→4		5	X 7

X interchangeable; in boys the upper fourth erupts first, in girls, the lower third.

The graphs for both groups show the second permanent molars placed at the end of the eruption order. There exists, however, a great range of variation

which often shows the second premolar erupting simultaneously with the second permanent molar. Recently Bay[5] demonstrated that in the available fossils and all the examined prehistoric jaws of pubescents, the permanent second molars emerge at the same time or even before the second premolars. This eruption mode was termed "antique," but it is still found among certain aborigines, for instance, the Papuans and the New Caledonians.

In comparison to both human modes, the modern and antique, the eruption order of Macaca discloses a more primitive stage in this orthogenetic evolution. In Macaca there is even an interval between the eruption of the second permanent molars and the subsequent appearance of the premolars. A sexual difference is observed in the sequence of the premolars and canines which is probably due to the great difference in tooth size of the latter; in the female the lower canines erupt first in the mandible before the premolars; in the male the canines appear later. According to the observations reported by Cohen,[10] Degerbohl,[11] Steggerda,[32] and Hellman,[17] the same situation still holds true in the human being. This could be interpreted as a remembrance of an ancestral pattern.

The literature contains a controversy in respect to the consequence of the retarded eruption of accessional teeth in the human dentition. Bolk[6] and Walkhoff[35] related it to the evolution of the human bony chin. Weidenreich[37] theorized that reduction in root volume of the lower incisors was responsible. Present observations, however, strengthen Sicher's[31] concept that the explanation of this evolutionary complex lies primarily in the phenomenon of shortening of the jaws. Macaca offers an instance in which a prognathic and chinless mandible is paired with very slender incisor roots in a very spacious dental arch. Yet, it has not been pointed out so far that in man a reduction in length of the alveolar process must have taken place at both borders anteriorly and posteriorly and that the consequent effects upon the involved tooth groups were different.

The delayed or incomplete eruption of the accessional teeth in man is due to a retardation of modeling resorption at the anterior border of the ramus and a slowed down apposition at the maxillary tuberosity and palatal sutures.

Reduced growth in the anterior portion of the alveolar process, however, has a directly opposite effect upon the successional teeth. This is evidenced by a comparison between the normal processes in Macaca and man. Following circumferential bone apposition, the deciduous incisors of Macaca at a certain time move forward and laterally and become separated. As they leave their successors somewhat lingually behind, their roots are only partly resorbed, and these teeth, therefore, are retained for a long time. In man no forward extension of the *deciduous* arches was found, and the successional teeth are situated almost straight below their precursors, bringing about a fast vertical exfoliation of the latter. This may account partly for the puzzling fact that in modern man the successional dentition is accelerated whereas the accessional dentition is retarded.

This evolutionary trend is different in both jaws. The human mandible behaves more progressively in this respect. There are the lower permanent incisors which tend to erupt before the six-year molars. There also is a

greater tendency toward a reduced forward growth for the lower alveolar process.[4] This has distinct consequences which are important to know because of their implication in orthodontic therapy.

Reduction of mandibular forward and lateral growth is responsible for an increased incidence of crowded anterior teeth. Biologically, therefore, it is not conceivable that this most involved area of the human face and dentition should be selected as a stable axis from which to decide upon orthodontic measures.[34] The concept of a "deficient basal bone" is used more as a term of convenience than a biological entity. It is determined only by the axial inclination of the supported incisors instead of the absolute length of the jaws. Yet the anthropometric classification in orthostatic and clinostatic position of the incisors expresses the existence of a normal variety.[23] Comparative morphology reveals its specific character. Macaca is an instance where the clinostatic angulation of the permanent incisor succeeds the less procumbent position of the deciduous incisors due to forward growth of the alveolar process. In the Great Apes and fossil Hominidae, the lower permanent incisors remain more orthostatically related to a chinless mandible. A comparable situation in recent man is retained only in the most primitive races as in the Melanesians (Schwarz[28]). Examples with extreme clinostatic or bimaxillary protrusion are found among the Negro race (Martin[23]).

Less forward growth of the mandibular alveolar process as compared to the maxillary is responsible for the development of an incisal overbite. This was illustrated with the exceptional overbite of Specimen 28. Human phylogeny furnishes more complete evidence. It demonstrates that incisal overlapping is a human acquisition of the last millennium (Lundström,[22] Teuber[33]). Equal forward development of both alveolar processes has been shown to be responsible for the maintenance of the incisal edge-to-edge bite in the succeeding dentitions of Macaca. Measurements indicated that this was achieved without any positive vertical growth either at the alveolar crest or the mandibular condyle. There is accumulated evidence that the establishment of the incisal relationship in man is effected through the same mechanism. Wylie[39] showed conclusively that the development of ramus height has no correlation to the development of overbite. In a clinical survey on 52 developing dentitions the amount of mandibular forward extension was found to be correlative to the degree of overbite.[4] A synthesis of these findings, therefore, would suggest that prevention or correction of any pathologic degree of overbite primarily should assail the causative sagittal malrelationship rather than the secondarily related decreased dental height.

The almost three times greater increase in the longitudinal dimension of the mandibular body over the vertical increase in ramus height during the four developmental periods studied in Macaca brings up the question whether the endochondral growth center at the condylar head merits the generally accepted claim to be the chief site of mandibular growth.[9, 31] Further histologic study, it is hoped, will clarify this important question.

SUMMARY

A metric and roentgenographic study was made on the development of the dentition of 41 specimens and 6 skulls of Rhesus macaques. They covered four consecutive developmental periods. An outstanding finding consisted in the uniformity of the morphogenetic pattern of all the specimens of each period studied. The ontogenetic pattern of the Macaca dentition then was compared with that of man in order to gain some information about the direction of certain evolutionary trends in human phylogeny.

1. In the deciduous dentition of Macaca all the teeth were in proximal contact with the exception of the canines. "Ape spaces" existed mesially and distally to the lower canines and mesially to the upper canines. This arrangement can be found in man among deciduous dentitions of the spaced type. The fully closed arch form, however, is an exclusive human type.

2. A terminal plane forming a mesial step consistently allowed the first permanent molars of Macaca to erupt directly into proper cuspal interdigitation. This mode is rarely found in man. His proper molar occlusion requires a physiologic movement of tooth groups over a variable period of time.

3. In Macaca there existed a distinct interval between the eruption of the permanent first molars and that of the permanent first incisors, during which an extension of the arches and a spacing of the deciduous incisors occurred. In man this phase is only rudimentary when, upon the eruption of the lower permanent first incisor, the still complete upper deciduous arch is somewhat spread in the anterior teeth.

4. No enlargement of the arches was observed in Macaca during the replacement of the incisors. In man the expansion of the arches for the larger permanent incisors takes place during their eruption. Accommodating changes for the larger permanent incisors, therefore, are comparatively delayed and often reduced in man; they could be anticipated, however, in those deciduous human dentures which erupted with fully spaced anterior teeth.

5. In the eruption order of the permanent teeth of Macaca the incisors were followed by the second permanent molars; after a pause, an almost simultaneous eruption of the posterior successional teeth occurred. In comparison to the whole eruption sequence of Macaca, that of man reveals *a relative retardation of the accessional teeth and a relative acceleration of the successional teeth.* Both phenomena were shown to be related to reduced longitudinal growth of the human jaws. The mandible behaves more progressively in this trend; this is responsible for increased incidence of crowded anterior teeth and deep overbite in modern man.

6. The consistent end-to-end bite of the incisors in Macaca was found to be due to an equal forward development of both jaws in the absence of vertical growth of the alveolar process and mandibular ramus. The determining factor in the degree of incisal overbite in man is likely to be also the alveolar forward development and only secondarily the vertical growth.

7. The dentofacial proportions in Macaca were seen to be subjected to considerable changes during development, whereas Brodie revealed in this respect a high individual consistency in man.

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ANTHROPOMETRIC METHOD OF FACIAL ANALYSIS IN ORTHODONTICS

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IT WOULD actually be more exact to say Hellman's anthropometric method, for it was Dr. Milo Hellman who adapted physical anthropology to orthodontic research. He used this method to achieve his monumental work in growth and development and many other of his research problems, besides incorporating it into his practice of orthodontics.

This paper deals with the method of anthropometric examination using direct measuring instruments, the anthropological background, the anatomical landmarks involved, a description of the instruments used, the list of measurements taken, the methods of analysis of the data obtained.

BACKGROUND

The primary interest in facial analysis by anthropologists was in connection with racial differences.

The first attempt at this was by Petrus Camper.[1] He employed the "facial angle" which was drawn upon the lateral aspect of skulls and living heads indifferently, and was that formed between a line passing through the base of the nose and the auditory meatus and one roughly tangential to the profile. Camper found this angle to average 70° in Negroes, 80° in Europeans, 90° in Classical Greek statues dilineating mortals, and 100° in certain of their representations of gods. On the other hand, the apes, monkeys, and lower mammals gave angles less than 70°. Camper's angle was gradually abandoned as it was found to vary considerably within races.

At the Anthropological Congress held in Frankfort in 1884, it was agreed to accept as standard the horizontal line introduced by Von Ihering in 1872,[2] which was thereafter referred to as the Frankfort horizontal. The Frankfort plane is drawn through the upper periphery of the two ear holes, and the lowest point to the left infraorbital margin. A facial angle measured from this plane shows, according to Luthy,[3] only slight variation within races, and serves as a means of differentiating between different races.

The concept of prognathism has been discussed by many investigators who have used various definitions and methods of measurement. The commonly used method is now to define the degree of prognathism of the upper jaw by

This thesis was submitted to the American Board of Orthodontics in partial fulfillment of the author's requirements for certification.

the angle formed between the Frankfort plane and a line in the facial profile, from nasion to prosthion. Luthy[3] suggested the following classification based on this angle:

Hyperprognathic	69.9° or less
Prognathic	70.0°-79.9°
Mesognathic	80.0°-84.9°
Orthognathic	85.0°-92.9°
Hyperorthognathic	93.0° or more

Protrusion of the jaws beyond vertical planes drawn at right angles to the Frankfort plane is assessed by linear measurements. To cite a few, Dreyfus[4] drew a vertical plane through nasion, Simon[5] drew one through orbitale, the so-called Simon's orbital plane.

Broca,[6] an early French anthropologist, established a number of definite points on the skull surface which were mostly without special anatomical significance, and which were consequently without special anatomical names, but which became of importance to him as the termini of essential linear measurements. To many of these he gave distinctive names such as "glabella," "inion," and "bregma," thus avoiding the inconvenience of using a long phrase every time they were employed.

Von Torok[7] carried systemization a great deal further, suggesting a vast number of new cranial points and supplying Greek and Latin terms for those which Broca had neglected in this respect. His list, therefore, which incorporates Broca's, practically exhausted the possibilities. In more recent years, Martin[8] recapitulated and somewhat amended Von Torok's list; his is the largest for present-day reference. In this country, definitions have been published by Hrdlicka,[9] by Wilder,[10] although those of the latter correspond very largely with Martin. They are also used on the living when applicable.

ANATOMICAL LANDMARKS

Following is a list of anatomical landmarks used in this method. These definitions are compiled from a combination of Wilder,[10] Hrdlicka,[9] Hellman,[11] Howells,[12] and others where specifically stated. Figs. 1 and 2 show the skull in front and lateral views placed in the Frankfort horizontal with the landmarks used in this analysis indicated. These are adapted tracings from Wilder.

Nasion.—Nasion is the upper end of the internasal suture, where it meets the frontal; the point where the two nasal bones and the frontal come together. Hrlicka[9] stated: "Look for the nasion by passing the nail (finger) along the bridge of the nose until it encounters a slight ridge which is formed by the inferior border of the frontal, or the depression of the nasion itself." Ashley-Montagu[13] suggested that the nasion in the living be looked for at the point at which a horizontal tangent to the highest points on the superior palpebral sulci intersects the midsagittal plane. Clinically, a combination of these seems indicated and nasion is marked with a soft lead pencil.

Menton or *Gnathion.*—Menton or gnathion is the lowest median point on the lower border of the mandible. This has nothing to do with a palable

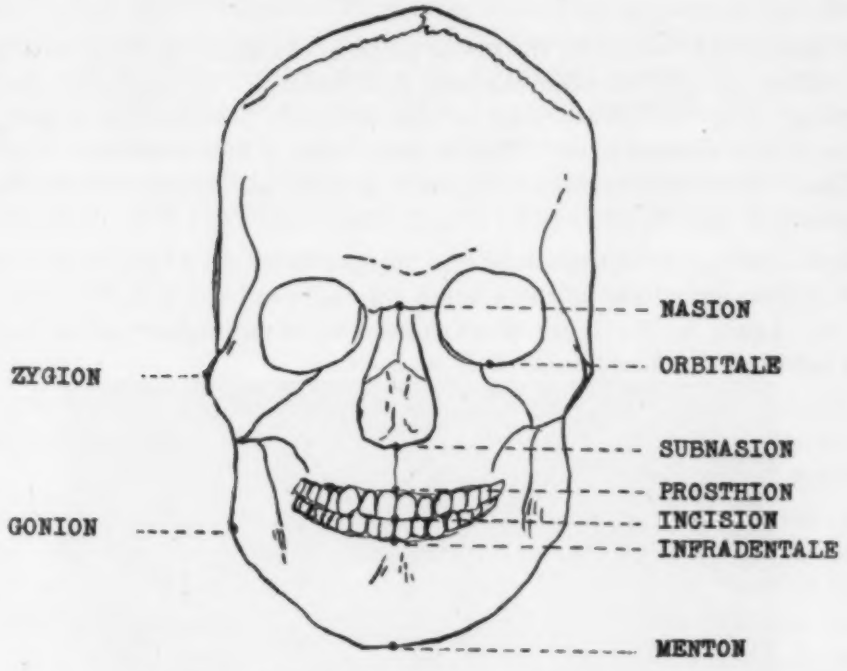


Fig. 1.—Anatomical landmarks on skull, front view.

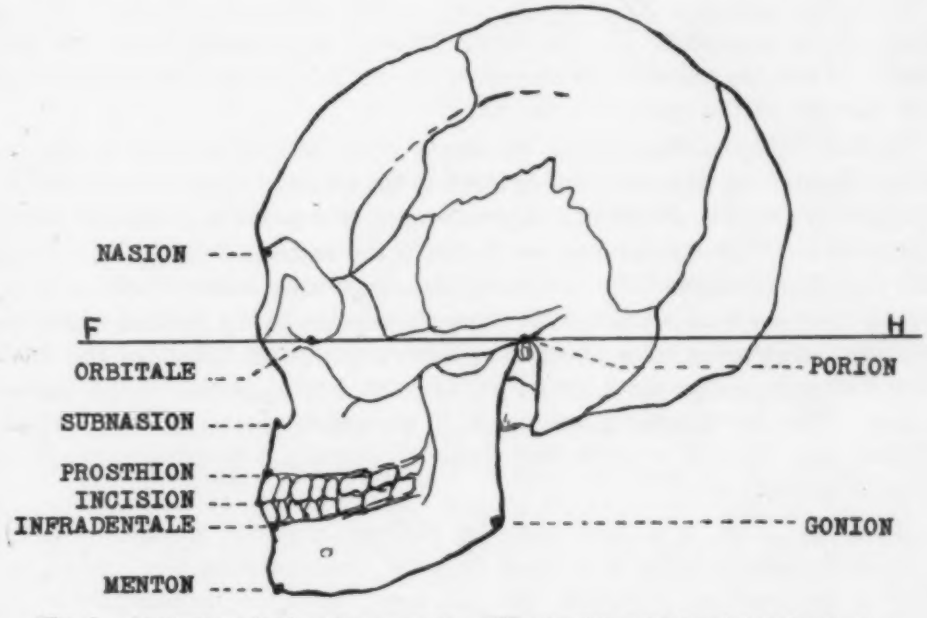


Fig. 2.—Anatomical landmarks on skull. *FH*, Frankfort horizontal, lateral view.

mental eminence on the anterior surface. It is nowhere specified, but it is implied that menton is the lowest point with reference to the facial height.

Prosthion.—Prosthion is the lowest point of the intermaxillary suture, upon the alveolar margin, between the two first incisors. In the living, according to Martin,[8] it is the lowest point of the soft gum between the upper central incisors in the median plane. This is, therefore, a slight distance below bony prosthion. The labial surface of the arch is obviously meant, but not specified. Apparently it was Martin's point that Hellman used.

Infradentale—Infradental is the highest point in the anterior alveolar margin of the mandible in the median line between the first two mandibular incisors. Again, in the living, it is taken to mean the highest point in the gum tissue between the mandibular first incisors.

Incision.—Incision is a point in the midsagittal plane where that plane intersects a line drawn between the lowest points on the incisal edges of the two maxillary first incisors.

Subnasion or *Nasospinale.*—This is the lowest point in the midsagittal plane of the anterior margin of the lower margin of the nasal aperture. Howells defines this as: the apex of the angle formed by the lower border of the nasal septum and the surface of the upper lip or the junction between these two.

Zygion.—Zygion is the most lateral point of the zygomatic arch, a point determined by the trial measurement and not by anatomical relations. Hrdlicka suggests it "should be searched for with care, for it is often located more posteriorly than one would expect."

Condylion-laterale.—This is the most lateral point on the surface of the condyle of the mandible. In the living this can be palpated when the jaw is opened. When the mandible is closed, the point is usually just anterior to the upper margin of the tragus of the ear.

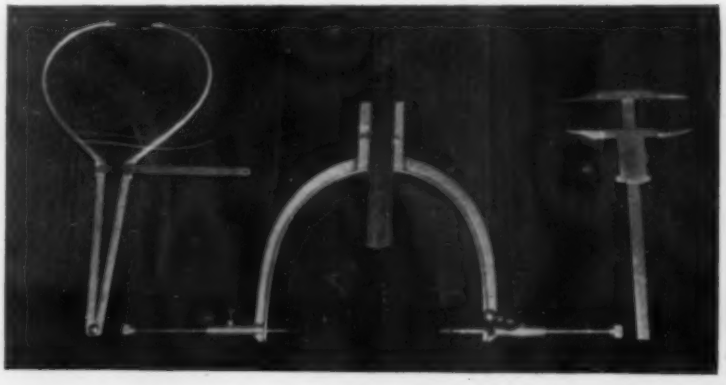
Gonion.—Gonion, literally, is the angle of the mandible between the body and the ramus. In practice, this is hard to determine in jaws with a rounded angle, but in cases in which this is pronounced, the point taken is the anterior lower corner of the square process forming the angle. Where the outline is softer and more rounded, by following the marginal contour backwards from the body, there is seen a slight curve upwards, immediately behind which there is a slight suggestion of a tubercle. This is the point taken as the gonion. In the living, it is described by all as the most lateral points of the angles of the jaw. This unity among authors is a concession to the difficulty of using anything else. Martin remarks that there is generally a palpable concavity immediately anterior to it.

Auriculo.—This is a term used by Hellman but not specifically defined. He probably adapted the term from Broca's[6] "point auriculaire" which is the center of the meatus. Hrdlicka uses the term "auriculo" apparently meaning the upper margin of the meatus. In use, it is a small circle in the center of the cutaneous auditory meatus, where the ear plug of the head spanner is placed. It is called by Smyth and Young[15] "transmeatal axis."

Alare.—On the living, it is the end points of nasal breath, the mutually most distant points on the alae of the nose.

Porion.—This is the uppermost point in the margin of the auditory meatus; the points which, with orbitale, define the Frankfort horizontal. As an aid to location, Ashley-Montagu[14] suggests taking a point corresponding to the position of porion 5mm. above and 2 mm. posterior to the central point of the cutaneous auditory meatus. Actual porion is on the average situated some 9.6 mm. medial to such a point.

Orbitale.—This is the lowest point in the margin of the orbit, located by palpation on the bony ridge of the orbit and locating the lowest possible point. This with porion make up the Frankfort horizontal.



A. *B.* *C.*

Fig. 3.—Anthropometric instruments. *A*, Spreading calipers; *B*, Todd head spanner; *C*, sliding calipers.

INSTRUMENTS

The method described here, as stated before, follows Hellman's in all known detail, but is actually described as used by this author. The instruments used are sliding calipers, spreading calipers, and the Todd head-spanner. Fig. 3 is a photograph of the three instruments. The sliding calipers is of the 20 cm. size calibrated in millimeters. The spreading calipers has a maximum reading of 25 cm. and is calibrated for every 2 mm. but still read to the nearest millimeter. The rule used in the head spanner is also 25 cm. size calibrated and read in millimeters. The method of handling varies with the operator. The author uses the instruments as follows.

Sliding Calipers.—The blunt side of the fixed arm of the calipers is held close to the edge, by the forefinger, middle finger, and thumb of the left hand and held over one of the landmarks involved. The movable or sliding arm of the instrument is held in the right hand and is slid up to the second landmark involved. This sliding to the point is repeated several times to reduce possible error. For illustration of the sliding calipers in use, see Fig. 4; showing its use in total face height.

Spreading Calipers.—In this instrument either arm is movable and both are usually moved simultaneously. Each arm of the instrument is held by the forefinger, middle finger, and thumb of the operator's corresponding hand, in a similar position as a pencil is held. The fingers practically overlap the edge of the instrument so the operator can feel the amount of pressure exerted by the instrument over the soft tissue covering the bony landmarks. The instrument is spread and reduced over the two landmarks involved several times and the average noted. Another method is to glide the points over the landmarks and note the widest points, as in bizygomatic, head length, and head width. For illustration of the instrument in use measuring bizygomatic width, see Fig. 5.

Fig. 4. Fig. 5. Fig. 6.

Fig. 4.—Sliding calipers being used to take total face height.
Fig. 5.—Spreading calipers being used to take bizygomatic width.
Fig. 6.—Todd head spanner being used to take auriculo-menton.

Todd Head Spanner.—This instrument actually measures the distance of any given point in the midsagittal plane to the circumference of a cylinder 6 mm. in diameter (the diameter of the ear plugs), drawn between the centers of the cutaneous auditory meati. This is called by Smyth and Young[15] the "transmeatal axis." The ear plugs are inserted into the meati and the instrument centered so that the rule points at the midsagittal plane. The operator must support part of the weight of the instrument to prevent patients from complaining of the weight in the meati. The bow of the instrument is held in the left hand, while the right hand slides the rule to the landmark. This sliding is repeated several times and an average taken. Fig. 6 shows the instrument in position for auriculo-menton measurement. It is good practice to check the ear plugs several times during the series of facial depth measurements, to be sure they are in proper position.

MEASUREMENTS

The measurements are divided into three groups: height, width, and depth.

Height is measured with sliding calipers.

Total face height is measured from nasion to prosthion.

Lower face height is measured from menton to infradentale with slight pressure against menton.

Dental height is measured from prosthion to infradentale with teeth in occlusion.

Nasal height is measured from nasion to subnasion but with very slight pressure on the subnasion.

Nasion-incision is measured between the points named.

Ramus height is measured from condylion to gonion approaching gonion from below.

Width is measured with spreading calipers.

Bizygomatic width is measured between the two zygions.

Bicondylar is measured between the two condylions. Take measurements slightly anterior to the tragus of the ear. To check, place instrument, held lightly, slightly below the zygoma and have the patient open and close his mouth several times; the condylions will spread calipers to proper measurement. In other words, measure greatest width of head of condyle as it comes below the zygoma in protrusive position.

Bigonial is the measurement between the two gonions, the greatest width between the gonial angles, using slight pressure as well as trying to avoid the fleshy parts of the masseter muscle. This can be done in part by rolling the end of the instrument around gonion before resting it on gonion.

Nasal width is the measurement between the lateral margin of the nasal apertures at their widest points without pressure; between alae.

Depth is measured by the Todd head spanner.

Auriculo-prosthion is measured from the transmeatal axis in the midsagittal plane to prosthion with no pressure on prosthion.

Auriculo-infradentale is measured from the transmeatal axis in the midsagittal plane to infradentale with no pressure on infradentale.

Auriculo-incision is measured from the transmeatal axis in the midsagittal plane to incision.

Auriculo-subnasion is measured from the transmeatal axis in the midsagittal plane to subnasion using slight pressure on subnasion, but do not press.

Gonion-menton is measured from gonion, taken from behind the angle of the ramus, to menton approached from the anterior aspect, using slight pressure on each. Right and left should be taken and an average figure used. (Spreading calipers used.)

Condylo-menton is measured using an anterior approach to menton with slight pressure on that point. (Spreading calipers used.)

Anthropometry, like orthodontics, is an art as well as a science. Carrying the simile still further, there are three requirements to proficiency: knowledge, training, and practice. Without the third, the first two are of no avail. The operator must not only know on paper where the anatomical landmarks are, but be just as familiar with clinical material. The operator must get acquainted with these landmarks by touch. It is by constant exploration of a variety of types of faces that the landmarks become familiar. Before any measurements are attempted, the landmarks should be located by fingertip to determine the proper pressure necessary to produce a comparatively correct reading. All measurements of a given study or series should be done by one individual to reduce error. All measurements should be repeated and an average taken.

The handling of these anthropological instruments requires skill, but, by background, the orthodontist is well equipped to acquire that skill. The author first used this method in 1940 as a measure of facial growth and development in children manifesting endocrine disorders.*[20] In preparation for this, a private course was taken under Dr. F. M. Ashley-Montagu. However, it was not until 1946 (after returning from military service) that the anthropometric survey was included in the routine office examination of patients. The chart for clinical recording is patterned after Hellman's[16] and appears as Chart I.

The dental chair makes an excellent place for examination.

CHART I

Name:	Date of Examination:	Classification: Bite
Sex:	Date of Birth:	Age: Yr. Mo. Days
Head Length:	Total Face Height:	Auricular Height:
Head Width:	Upper Face Height:	Nasion-Bregma:
Min. Frontal:	Lower Face Height:	Auriculo-Nasion:
Bizygomatic:	Incision-Menton:	Auriculo-Prosthion:
Bicondylar:	Dental Height:	Auriculo-Infra:
Bigonial:	Nasion-Incision:	Auriculo-Incision:
Gonio-Menton:	Nasion-Infra:	Auriculo-Menton:
Right Left	Nasal Height:	Auriculo-Subnasion:
Nasion-Gonion:	Nasal Width:	Interorbital:
Condylo-Menton:	Ramus Height:	Height: In.
Nasion-Condylion:	Nasion-Frankfort	Weight: Lb.

V IV III II I	I II III IV V	8 7 6 5 4 3 2 1	1 2 3 4 5 6 7 8
V IV III II I	I II III IV V	8 7 6 5 4 3 2 1	1 2 3 4 5 6 7 8

Remarks:

Stage: (Hellman's)

Analysis of Measurements.—In order for measurements to have meaning, there must be a comparison—a comparison to a former measurement of the same individual, or to a standard. There are three studies of facial growth that could be used as standards:

1. Smyth and Young[15]
2. Marcus Goldstein[17]
3. Milo Hellman[18]

*In clinic of Philadelphia Institute for Medical Research, Philadelphia General Hospital, Dr. Leonard G. Rowntree, Director.

Smyth and Young and Goldstein used chronological age groupings; Hellman used developmental stages. This author uses Hellman's standard, so these will be discussed further.

The stages as applicable to his standard measurements as defined by Hellman[11, 19] are:

I A. When the infant begins to get teeth.
I C. Beginning phases of erupting second molars.
II A. When, by the acquisition of the second deciduous molars, the deciduous dentition is completed.
II C. Beginning phases of erupting the first permanent molar, including the elimination of deciduous incisors and the eruption of their permanent successors.
III A. When the permanent first molar is added on behind the deciduous dentition.
III B. Time of elimination of deciduous canines and molar teeth and the acquisition of their successors.
III C. Beginning phases of erupting the second permanent molars.
IV A. When the permanent second molar is added on behind the first.
IV C. Beginning phases of erupting the third permanent molar teeth.
V A. When, by the addition of the third molar, the adult dentition is complete.

The usual and erroneous inference is that Stage II A indicates the time when the last of the deciduous teeth is erupted. It should, therefore, be explained that Stage II A, taken as an example, represents the average of children who possess the complete deciduous dentition. So also does the age of all other stages. Whereas, Hellman grouped patients according to their dental stage, he also gave the chronological age for the group, so an individual's measurements can be compared either way. In most cases the two coincide, but in unusual cases of over- or underdevelopment, the difference is considerable and the significance of comparison varies accordingly.

Hellman used several devices to portray his measurements graphically. In 1927,[11] he used what he called a "profilogram," a diagrammatic polygon representing the face in midsagittal section, which incorporated measurements of depth and height, but did not represent width. Fig. 7 shows a midsagittal profile constructed from figures of a Stage IV A male. This is constructed as follows: A circle 6 mm. in diameter is drawn which represents the center of the cutaneous auditory meatus, or the position of the ear plugs of the head spanner. The point porion is located 2 mm. behind and 5 mm. above the center of this circle. A line is drawn from point porion parallel to the bottom of the sheet; this represents the Frankfort horizontal, which serves to orient the profile. The points of a drawing compass are set at the auriculo-nasion measurement, and, setting one point at the periphery of the auriculo circle, an arc is drawn above the Frankfort horizontal. As all midsaggittal profiles are superimposed on the auriculo-nasion line, an average angle of 17° from the Frankfort horizontal is used. Along this angle a line is drawn to the auriculo-nasion arc, and where they cross is nasion. From nasion, an arc is drawn

using upper facial height, and from auriculo (again periphery of circle), an arc is drawn using auriculo-prosthion; where these two intersect is prosthion. In like manner, using dental height and auriculo-infradentale, point infradentale is located. Also, using lower facial height and auriculo-menton, point menton is located. The location of gonion is more of a problem as the gonion-menton measurement is not in the midsagittal plane. An adjusted (midsagittal) gonio-menton measurement is calculated by taking the square root of the difference of the square of half the bigonial distance from the square of the gonio-menton distance. Another method, if calculation is not preferred, is actually drawing the triangle formed by the gonions and menton and measuring the line that forms a perpendicular from menton to bigonial axis. An arc is described using this midsagittal gonio-menton measurement from point menton. Where this crosses the arc of ramus height is taken as gonion. For this last arc, Goldstein[17] uses the nasion-gonion measurement, adjusted to this midsagittal plane, using the triangle formed by the two gonions and nasion.

This midsagittal profile can be used as a measure of prognathism. Fig. 7, when measured for angle of prognathism, shows 91°. This just about checks with the same angle as measured by Bjork.[21] Using the roentgenographic method, Bjork found this angle to average 90.8° (p. 64) in young adults, and average 91.5° (p. 126) in boys 12 years of age.

While Hellman apparently abandoned these "profilograms" for the more complete "wiggle"[16] that incorporates all three dimensions of height, width, and depth, the author feels that for certain important phases of growth and change, the "profilograms" are more illustrative. For example, Fig. 8 shows a composite midsagittal profile of a treated case of severe Class II, Division 1 malocclusion before and after treatment. Of course, the change shown represents growth from age 14.6 years to 18.9 years, as well as any change produced by orthodontic therapy. The resultant change seems to indicate, however, that in this case there was a forward "swing" of the mandible, probably produced by the long use of elastics followed by the inclined plane type of retainer. The after measurements were taken about one year after appliances were removed.

As mentioned before, Hellman devised what he called the "wiggle" which is an ingenius device to compare any given set of measurements to the arithmetical mean and standard deviation of the stage involved. The symmetrical polygon is actually the range of average, and is constructed as follows: A vertical line is drawn that represents arithmetical mean of all the measurements listed. To paraphrase, the point on this line opposite any measurement represents the mean for that measurement. The area left of this line is the minus side, the right, the plus. The standard deviation for each measurement is then plotted on the plus and minus sides, using 2 mm. as unit of measure to make the spread larger. These plotted points are then joined to form the symmetrical polygon which represents the limits of standard deviation. To plot an individual's set of measurements, the difference between each measurement and its mean is plotted on the plus or minus side, depending whether

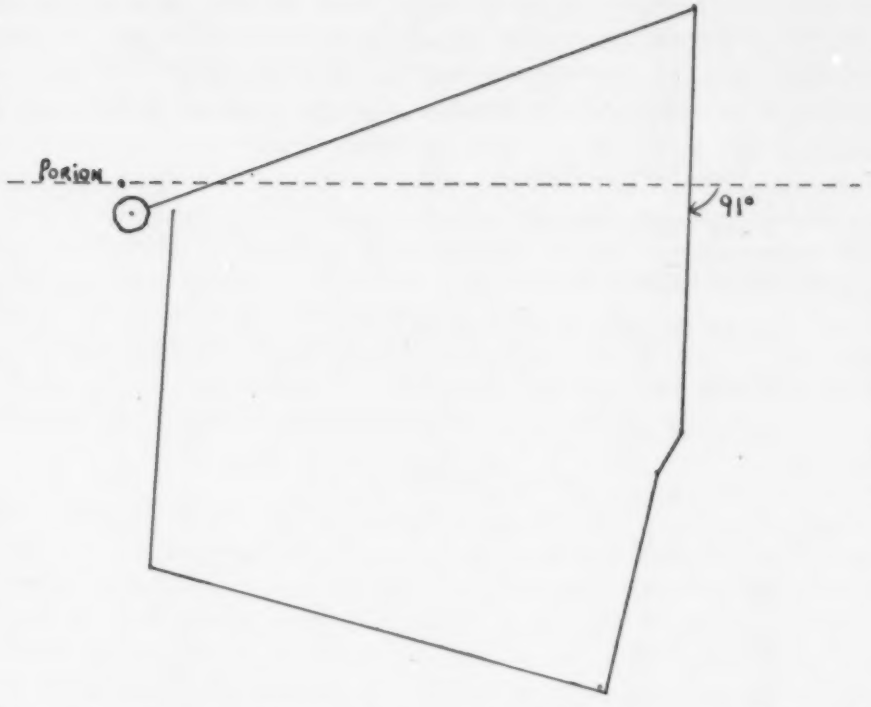


Fig. 7.—Midsagittal profile—standard IV A male from Hellman's figures, page 345 of [20].

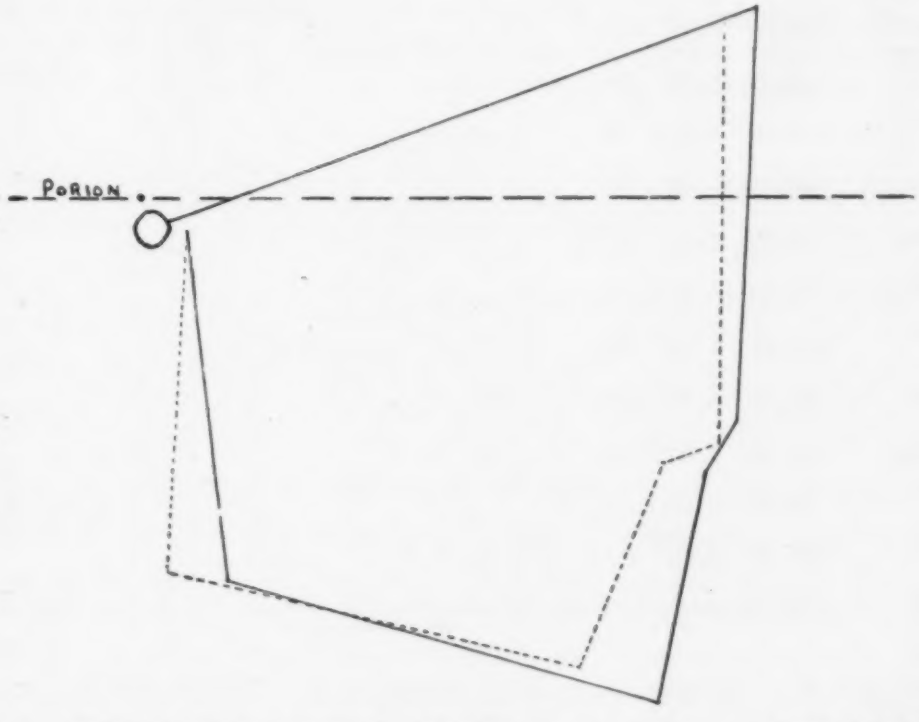


Fig. 8.—Midsagittal profile; Class II, Division 1 case. - - - - - - - - - - -, Before treatment; ————————, after treatment.

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it is greater or less than mean, again using 2 mm. as unit on the graph. When these plotted points are joined, the "wiggle" is produced (Fig. 9). It is readily ascertainable how the measurements of the individual compare to the mean and standard deviation of the group. For convenience, millimeter graph

	M	S.D.	H.S.
GE	14.89	2.70	15.6.
EIGHT	65.21	5.22	63.
EIGHT	127.38	33.01	115.
OTAL FACE HEIGHT	116.81	6.36	108.
PPER FACE HEIGHT	70.91	3.70	71.
OWER FACE HEIGHT	37.38	2.75	37.
NTAL HEIGHT	7.62	1.67	2.
SAL HEIGHT	54.52	3.06	54.
SION INCISION	77.08	5.89	75.
MUS HEIGHT	59.06	6.84	57.
ZYGOMATIC WIDTH	132.00	7.80	133.
CONDYLAR WIDTH	126.81	6.21	126.
GONIAL WIDTH	95.87	6.72	98.
SAL WIDTH	34.08	3.02	34.
RICULO-NASION	97.40	5.43	99.
RICULO-PROSTHION	96.51	5.30	99.
RICULO-INFRADENTALE	95.44	5.85	92.
RICULO-MENTON	110.58	7.74	102.
RICULO-INCISION	98.15	5.33	102.
RICULO-SUBNASION	94.00	5.66	99.
IO-MENTON	92.50	5.43	86.
DYLO-MENTON	128.47	8.79	118.

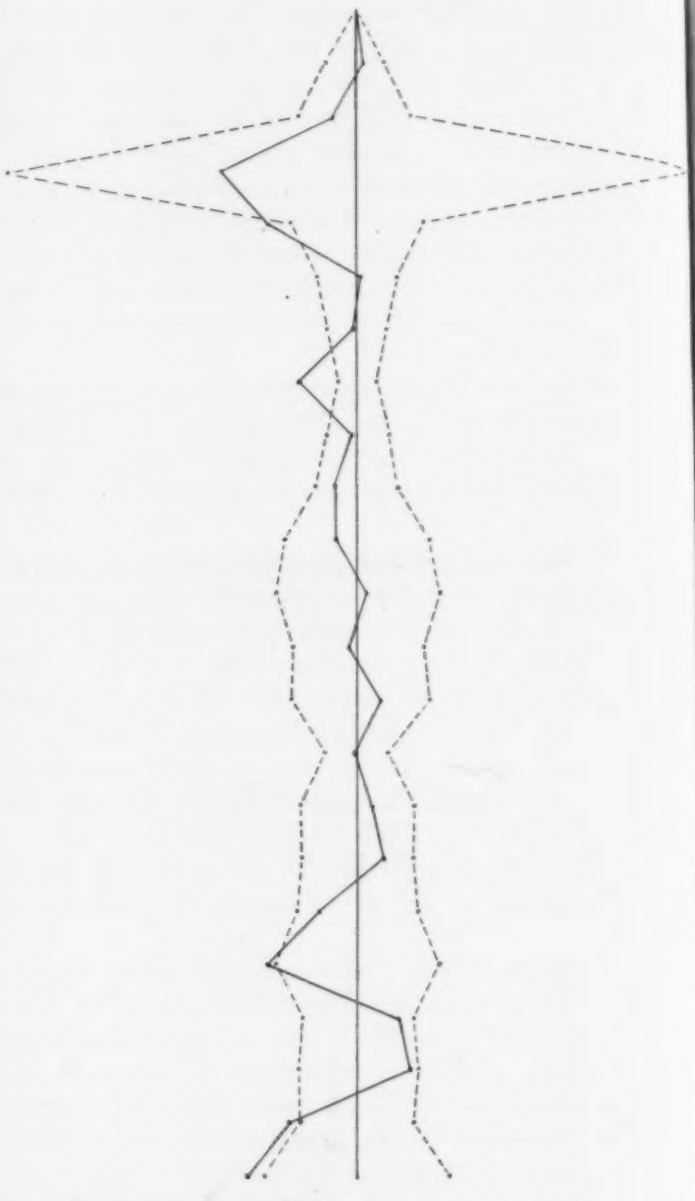

Fig. 9.—Class II, Division 1 malocclusion superimposed on polygon constructed from Hellman's figures IV A male, page 345 of [20].

paper is used. Clinically, to avoid the necessity of constructing a stage polygon for each patient measured, tracing graph paper is superimposed over the polygon and the "wiggle" plotted.

To illustrate the use of the polygon and wiggle, Fig. 9 shows the wiggle of the same patient used for the midsagittal profile in Fig. 8. An analysis of Fig. 9 (the Class II, Division 1 case, before treatment, superimposed on Hellman's standard IV A male) shows it to be under the lower limit of standard deviation on total face height, dental height, and the three measurements involving menton; auriculo-menton, gonio-menton, and condylo-menton. The smallness of total face height might be explained by the small dental height, that is, the extreme close-bite. The deficient menton measurements indicate the lack of average development in the body of the mandible. It is interesting to note, however, that auriculo-nasion is well on the plus side of the mean, indicating the Class II "effect" in this case was a combination of overdevelopment of the upper face in depth, as well as an underdevelopment of the lower face, though the degree of the latter was comparatively greater.

CONCLUSIONS

The author has felt for some time that the anthropometric method of facial analysis, using instruments as described, has been neglected by the orthodontic practitioner and researcher. Inasmuch as Dr. Milo Hellman pioneered the method and proved its use, it is felt that the method should find much wider use in private practice as well as in research. While it is true that error is found in measurements of this kind, a great many trends of growth, development, and therapy changes can be recorded with a significant degree of accuracy. The author is in no position to compare the accuracy of this method with the roentgenographic method used by Broadbent[22] and others. But the proper equipment needed for roentgenographic examination cannot be readily adapted to office routine, whereas the presently described method can.

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601 LANDIS AVE.

TIMESAVING TECHNIQUE FOR PROCESSING RETAINERS

HOWARD H. JAN, B.S., D.D.S., SAN FRANCISCO, CALIF.

SINCE the introduction of isothermal acrylic to the dental profession, many orthodontists were prompt to capitalize on its self-curing properties in the processing of retainers. Although there have been many methods reported in the literature[1, 2, 3] concerning the application of this material, the following technique will produce a better retainer in a shorter length of time.

A chronograph was used to measure the number of minutes required in the making of a maxillary retainer. From the study of twenty-four cases, the average time was found to be twenty-eight minutes per retainer. The time required for each step is tabulated in Table I. This does not include the time used in adapting the wires on the model, which is a step that varies with each individual operator and each particular case.

PROCEDURE

1. Adapt on the stone model one thickness of pink baseplate wax, or two thicknesses of No. 28 gauge green casting wax if a thinner retainer is desired. It is not necessary to seal the wax to the model nor to fill the interproximal spaces with wax.

2. Adapt a sheet of tin foil, 0.001 inch thick, on top of the wax, extending over the occlusal surfaces of the teeth.

3. Wrap a strip of boxing tin (ash metal) about 1¾ inches high around the model to form a matrix. Pour stone on top of the tin foil to make a counterdie.

4. When the stone is set, remove the counterdie and eliminate the wax pattern. The tin foil that was laid on top of the wax is now engaged to the counterdie. Tin foil is now adapted on the stone model.

5. The wires are now placed on top of the tin-foiled model. These may be adapted by the orthodontist either before step I or now, whichever is more convenient. If they were formed earlier they are put aside, and are not placed on the model until now.

6. These wires may be secured to the model by plaster or compound. The latter is always used in all rush cases, as there is no time lost in waiting for the material to harden.

7. Use any good self-curing acrylic and mix 2 c.c. liquid with 6 c.c. powder in a glass jar and spatulate thoroughly. Cover the jar until the mix begins to lose its stickiness. Adapt the acrylic to the area formerly occupied by the wax pattern. Pack the material to approximately twice the thickness of the wax. Now place a sheet of moistened cellophane on top of the acrylic, and the

Presented as a table clinic at the 46th meeting of the American Association of Orthodontists, May 9, 1950, at Chicago, Illinois.

counterdie on top of the cellophane. Use a simple C clamp or any viselike clamp to close the model and counterdie together, compressing the acrylic mass. Remove the counterdie and cellophane and trim off the excess material.

8. Leaving out the cellophane, replace the counterdie on top of the acrylic, and close with the C clamp again. When the die is in direct contact with the model, stop compression and maintain for fifteen minutes for self-curing to take place.

9. Remove C clamp, separate the die, and lift the retainer from the model for trimming. No polishing is necessary because the tin foil endues a dense shiny surface to the retainer.

TABLE I. AVERAGE TIME REQUIRED FOR EACH STEP

PROCEDURE	TIME IN MINUTES
1. Adapt wax	2
2. Tin-foil on wax	3
3. Form counterdie	2
4. Separate and tin-foil model	3
5. Adapt wires to model	
6. Secure wires to model	3
7. Mix acrylic, pack, and test	10
8. Use C clamp to hold	
9. Separate and trim	5
Total	28

THE ECONOMICS OF THIS TECHNIQUE

Comparing this method with the flask method, the amount of time saved per retainer is one hundred minutes or little over one and one-half hours. Assuming one averages two retainers per week, one would make approximately one hundred retainers a year. Since one can save one and one-half hours on each retainer with this technique, one can save one hundred fifty hours on one hundred retainers. If the office expense is only $5.00 per hour (probably more in most offices), a saving of one hundred fifty hours would mean a saving of $750. If one makes X times 100 retainers, one would save X times $750; or if one's expense per hour is X times 5, one would save X times $750. In many cases the amount saved per year can almost equal the net income for an average month. Money saved is money earned!

ADVANTAGES OF THIS METHOD

1. Compression of acrylic between model and counterdie tends to produce a retainer with maximum density.

2. Tin foiling the model and counterdie produce a smooth, shiny surface and no polishing is necessary.

3. Wax patterns give a uniform and controllable thickness to the retainer.

4. The tiresome steps of flasking, boiling, and polishing are eliminated.

5. Since the models and counterdies are not damaged during processing, repairs of broken retainers do not require new impressions, replacements for lost retainers may be made the instant one is notified by the patient, and the repairs can be completed before the patient arrives for the appointment.

6. Time saved from this technique gives the orthodontist and his assistant more time for other important duties, which when measured in terms of dollars can be quite a sizable sum.

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291 GEARY ST.

CASE REPORT

LAWRENCE FURSTMAN, D.D.S., BEVERLY HILLS, CALIF.

1. *Title.*—J. R., white girl, aged 12 years, 10 months, September, 1938.

2. *Diagnosis.*—Class II, Division 2 malocclusion and dental malfunction due to protraction of entire maxillary arch with extreme retroversion of the upper central incisors. Mild protraction in mandibular buccal segments with bilateral loss of arch integrity at lateral incisor-canine areas. Mild retroversion of the four lower incisors. Supraversion of both maxillary and mandibular anterior segments with associated infraversion in maxillary and mandibular buccal segments. Local dental anomalies present in both mandibular and maxillary arches.

3. *History and General Clinical Picture.*—Alert, vivacious girl, mentally acute with excellent posture and excellent general physical condition. Childhood diseases included measles, mumps, and chicken pox. Tonsils and adenoids removed at 5 years, no further history of operations. Tissue tone, good. Hygiene, excellent. Tongue and oral mucosa, normal. Swallowing, normal. Respiration and speech, normal. Family background, excellent with no history of familial pathology.

4. *Etiology.*—Incorrect locking of the first permanent molars caused a maxillary protraction plus the associated mandibular retraction. Normal breathing habits plus normal tonus of lip musculature caused a bilateral destruction of arch integrity in the maxillary central-lateral incisor area. Retroversion of maxillary central incisors caused a bilateral loss of mandibular arch integrity at the distal of the lower lateral incisors. Because of malposition of upper and lower incisors there was a marked change in the curve of Spee.

5. *Plan of Treatment.*—

A. General plan: Correct all localized dental anomalies and the curve of Spee. Re-establish the integrity of both dental arches. Carry the maxillary arch distally into correct relationship with the mandibular arch and with the cranium.

B. Appliances used: Edgewise appliance was placed in September, 1938. Gold arches, 0.022 inch round, were used for the first month with stops mesial to the molar tubes. These were then changed to rectangular gold arch wires 0.022 inch by 0.028 inch with stops mesial to all molar tubes. The lower arch was advanced very slowly and carefully until all anterior teeth were in good alignment. At this time a vertical loop was used to move the lower left first molar distally. New arches were substituted every three months. After all teeth were positioned, intermaxillary elastics of very light tension were used to move the maxillary arch distally. All rotations were finished and the appliance was removed in January, 1940.

C. Supplemental therapy: None.

6. *Progress of Case.*—Patient was seen at two-week intervals during the primary treatment. Cooperation was of the highest type. There was some breakage of appliances as is usually seen in malocclusions of this type.

Fig. 1.—J. R., 12 years, 10 months, September, 1938.

7. *Secondary Treatment.*—An upper Hawley retainer with incisal bite guide was used in the maxillary arch. The lower retention consisted of a fixed lingual retainer from lower first premolar to lower first premolar. The patient

was seen monthly for one year and then alternate months for six months. All retention was discarded in August, 1941.

8. *Results Achieved.*—Esthetic and functional results are most gratifying. Treatment objectives have been fulfilled.

9. *Observations and Conclusions.*—The results obtained in this particular case were considered protrusive by certain clinicians. It was felt that bad

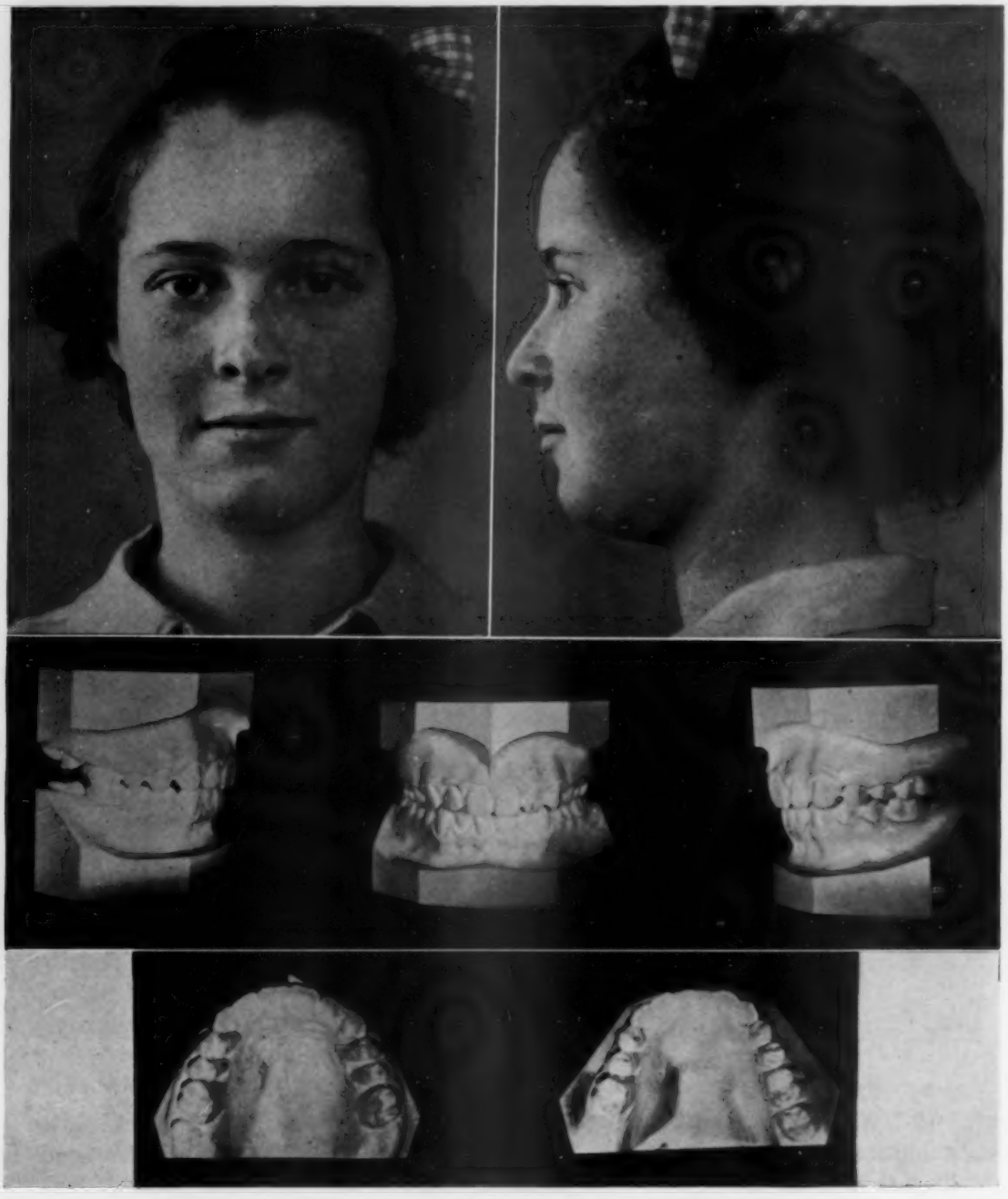

Fig. 2.—J. R., 14 years, 2 months, January, 1940.

judgment had been used by the operator because tooth structure had not been removed during treatment.

Studies of models and facial photographs made at the conclusion of primary treatment do not seem to substantiate these opinions.

Fig. 3.—J. R., 24 years, 3 months, February, 1950.

10. *Posttreatment Findings.*—Ten years after the conclusion of primary treatment the function and position of the teeth were excellent. The facial appearance was most pleasing. There was no evidence of relapse.

Dental roentgenographic studies made ten years following the conclusion of primary treatment showed all teeth in good position. The lower third molars had been removed. The upper third molars were still unerupted but were in good position. There was no evidence of caries. A slight degree of root resorption was observed on the four upper anterior teeth. Alveolar crest changes of a very minor degree were seen in the lower left buccal segment.

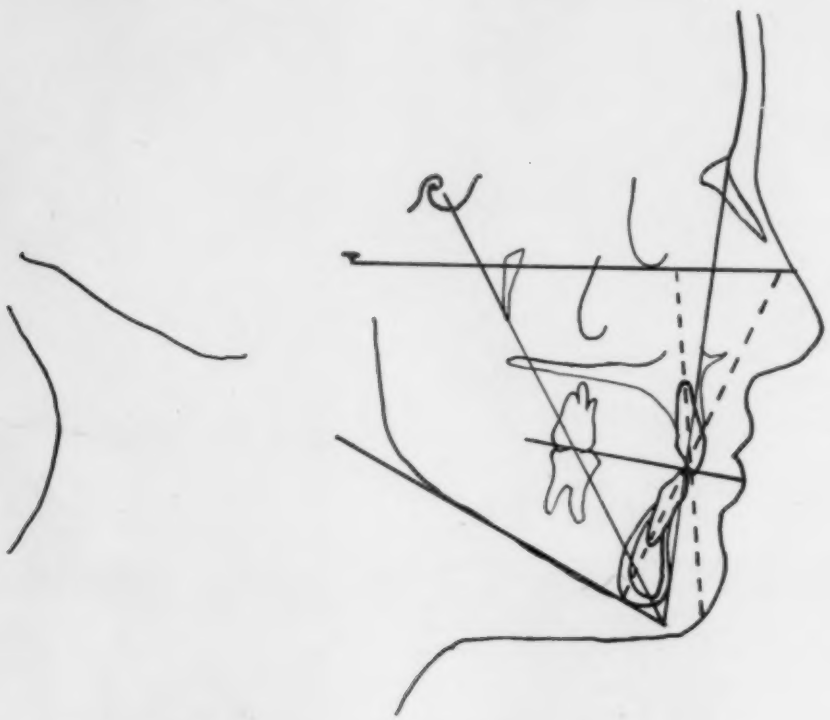

Fig. 4.—Tracing of cephalometric roentgenograph, February, 1950.

Cephalometric roentgenographic studies made ten years after the conclusion of treatment showed the following values as compared to the Downs analysis:

	J. R.	DOWNS MEAN AVERAGE
Facial angle	86.0	87.7
Angle of convexity	1.6	0.0
AB plane to facial plane	-5.5	-4.8
Mandibular plane	28.0	21.9
Y axis	61.0	59.4
Cant of occlusal plane	7.5	+9.3
Angle $\lfloor \underline{1}$ to $\overline{1} \rfloor$	149.0	135.4
Angle $\lfloor \underline{\underline{1}}$ to occlusal plane	14.0	14.5
Angle $\lfloor \underline{1}$ to mandibular plane	-3.0	+1.4
$\lfloor \underline{1}$ to A P plane (mm)	1.0	2.7

The mandibular plane angle and the Y axis are near the high range of Downs' studies. It is quite probable that these angles have increased in the ten years following the conclusion of treatment. This increase could be attributed to the final downward and forward growth of the face.

Studies of all records made ten years following the conclusion of treatment confirm the feeling that many cases that are considered to require extraction fall in a category that can be classed as borderline. It appears that careful conservation of mandibular anchorage plus the use of mild controlled forces makes possible the successful orthodontic management of many of these individuals without compromising arch integrity by removing tooth structure.

300 South Beverly Drive.

CASE REPORT

ERNEST L. JOHNSON, D.D.S., SAN FRANCISCO, CALIF.

1. *Title.*—J. B., boy, white, aged 11 years, 10 months.

2. *Diagnosis.*—The arch form of both jaws was good. The maxilla and upper teeth were in extreme protraction, with the upper incisors in supraversion, causing a slight reverse curve of Spee. The mandible and lower teeth were in retraction, with the lower incisors in supraversion and the premolars and molars in infraversion, causing an excessive curve of Spee. The roentgenograms revealed fair calcification of teeth and bone. Gnathostatic photographs revealed the extreme protraction of the maxilla and retraction of the mandible.

3. *History.*—The patient was large for his age and enjoyed excellent health. There was no history of serious illness. He was a bottle-fed baby. His childhood diseases were measles, mumps, and German measles. He had an average number of fillings.

4.—*Etiology.*—Persistent thumb-sucking, stomach-sleeping, chin-propping, and heredity.

5. *Plan of Treatment.*—

Treatment objectives:

1. To open the bite.
2. To move all upper teeth distally and inhibit further mesial growth of the maxilla.
3. To encourage mandibular development.
4. To correct the curve of Spee in both arches.

Mechanics of Treatment.—The case was completely banded using a universal appliance with 0.036 inch lingual stabilizing arches. The lower first molars were tipped distally and the premolars elevated to level off the lower arch and set up stationary anchorage. Occipital anchorage was directed against the upper first molars by means of a traction arch and bar. Simultaneously occipital anchorage was applied with traction hooks, engaging the labial arch distal to the upper central incisors to depress and move the anterior teeth distally. The headcap was worn fourteen hours a day and No. 5 light intermaxillary elastics were worn continually.

6. *Progress of Case.*—The patient visited the office at two- and three-week intervals during the nineteen months of primary treatment.

7. *Secondary Treatment.*—A Kesling positioner was worn for two months. When it was noted that the overbite was increasing, a maxillary Hawley retainer with bite plane and mandibular Hawley retainer were placed. The retainers were worn continuously for nine months, and nights only for the following six months to date. The patient has been advised to wear the maxillary retainer at night until 18 years of age.

Fig. 1.—May 29, 1945.

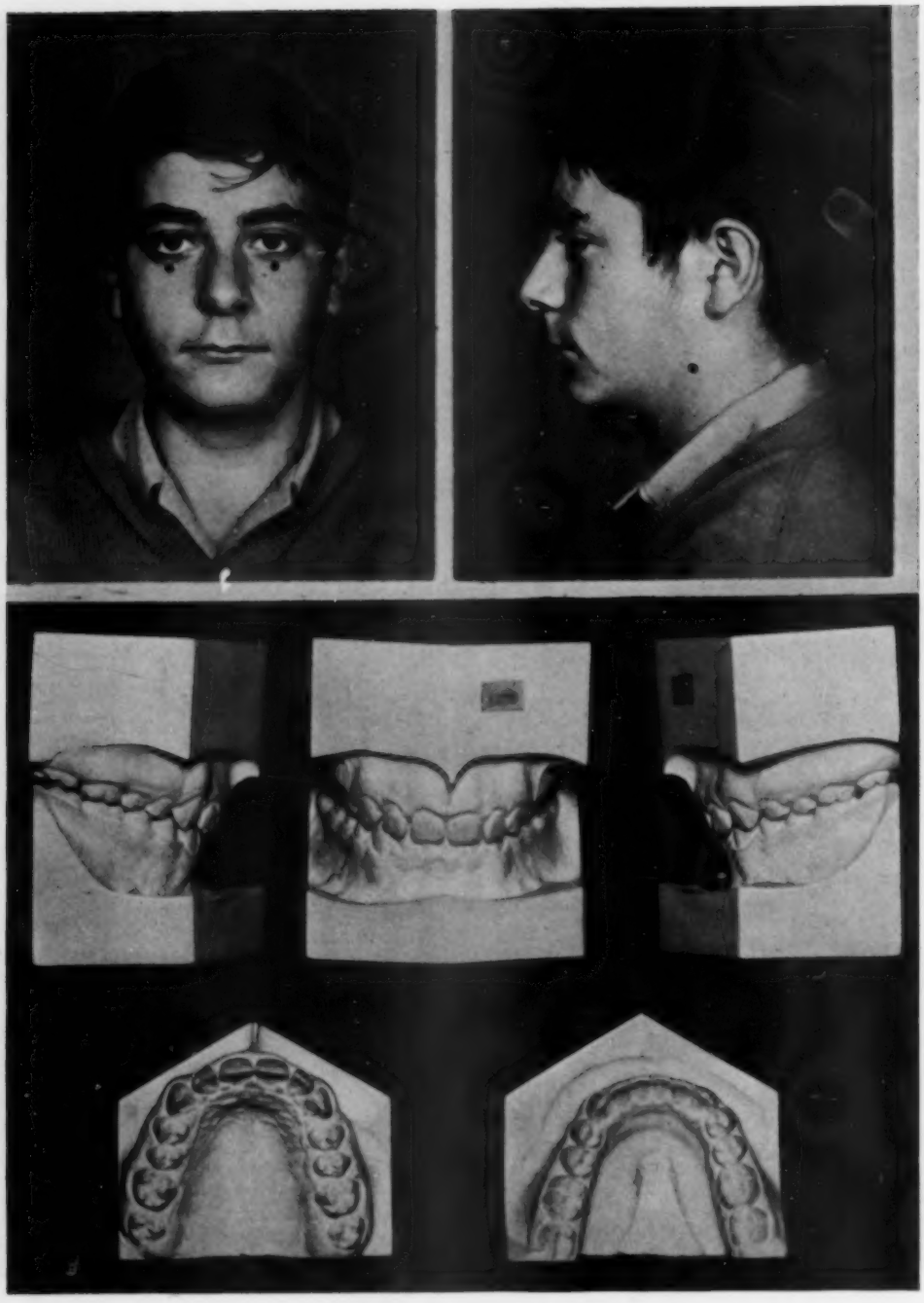

Fig. 2.—July 10, 1947.

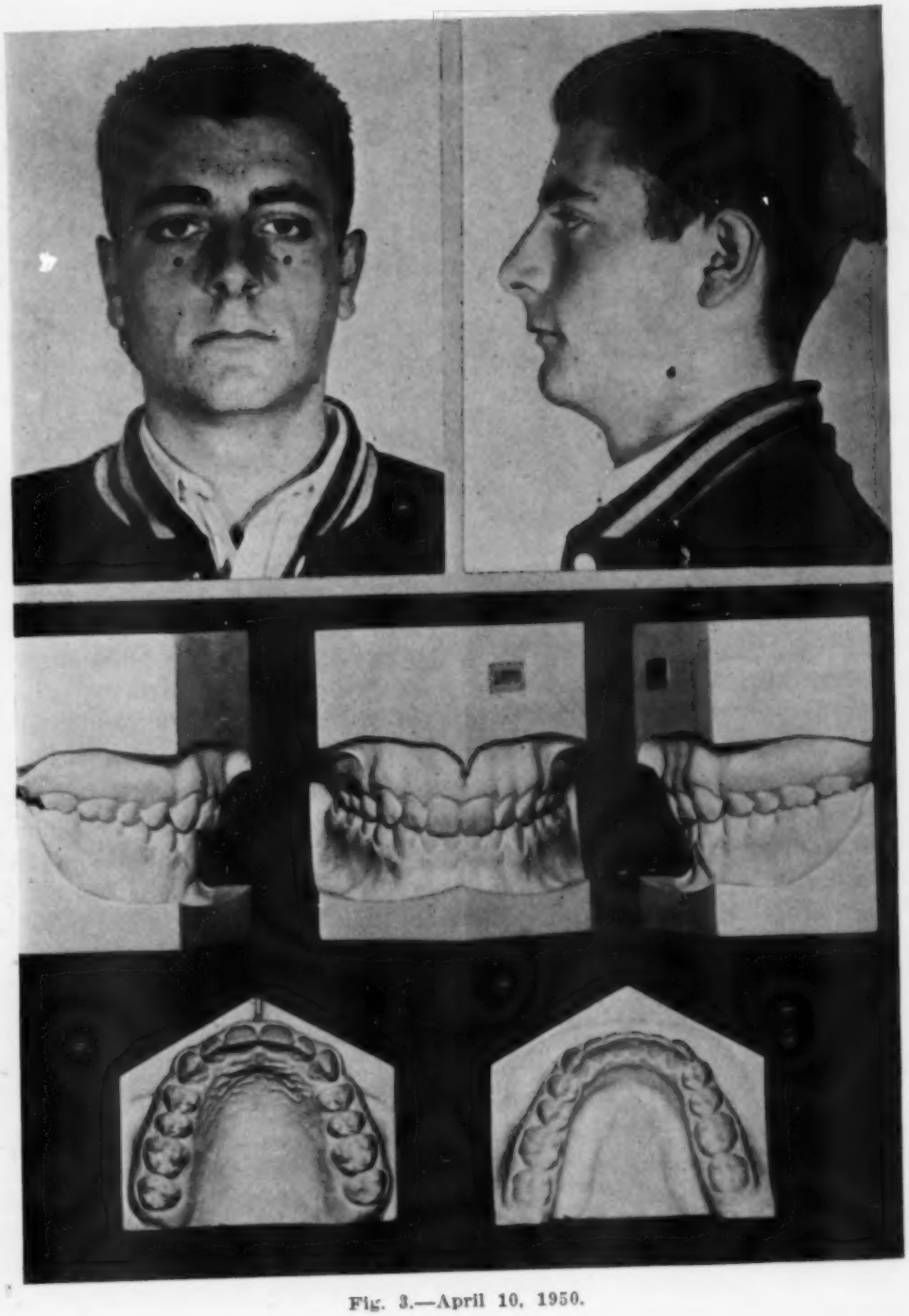

Fig. 3.—April 10, 1950.

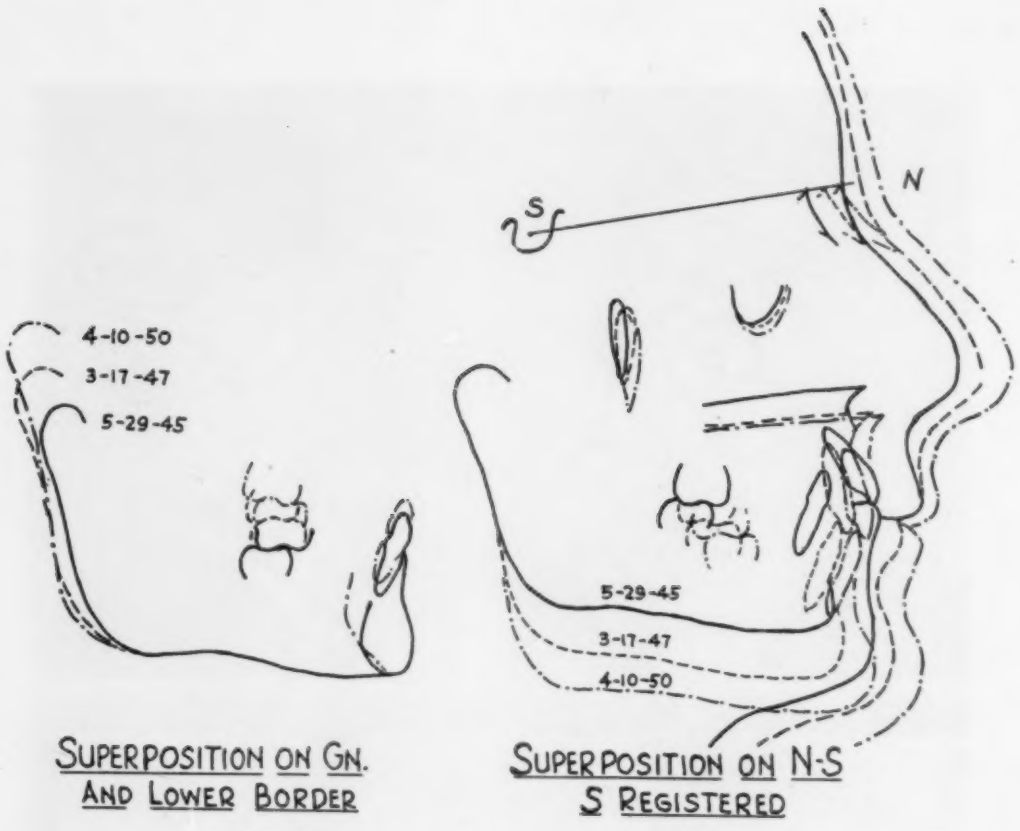

Fig. 4.

8. *Results Achieved.*—The overbite and overjet have been corrected and normal molar relation established. The maxillary protraction and mandibular retraction have been greatly reduced. This is demonstrated in the cephalometric head film tracings where the angle of convexity (Downs analysis) has dropped from 15° to 7° to 3° and the A-B facial plane angle from 15° to 10° to 6°.

9. *Observations and Conclusions.*—The successful conclusion of this case was due largely to the excellent cooperation of the patient in wearing the headcap and intermaxillary elastics and the favorable skeletal pattern with a most striking mandibular development during treatment. In spite of an unusually large mandible, the lower third molars and upper left third molar were congenitally missing.

10. *Posttreatment Findings.*—The final gnathostatic models, gnathostatic photographs, and cephalometric tracings were made two years and nine months after completion of the case. Fig. 4 is a composite of the tracings, made of the cephalometric head films. It shows the exceptionally favorable growth experienced by the patient both during and since his orthodontic treatment, as well as the changes brought about by the orthodontic treatment.

Reports

THE ANNUAL REPORT OF THE PUBLIC RELATIONS COMMITTEE OF THE AMERICAN ASSOCIATION OF ORTHODONTISTS, 1950

YOUR Committee feels that 1950 is a vital year in the course of our nation's history. It behooves each of us to guard against the infiltration of socialistic thinking in our reading, our communities, in both our public and private lives. We want our patients to have the finest that modern science has to offer. We, as orthodontists, do not wish to be placed under government control. All of us must do all in our power to prevent regimentation.

There have been a number of interesting, and, in some instances, perplexing things called to the attention of the Public Relations Committee during the past year. We have endeavored to carry out the high ideals that have been established in bygone years. It has been our pleasure to do a great deal of this work in cooperation with your untiring secretary, Dr. George R. Moore.

One of the things we were confronted with was what steps, if any, should be taken about a laboratory which has been sending letters soliciting impressions from the general practitioner offering to make models, diagnosis, and appliances constructed under the supervision of a practicing orthodontist, inferring that training in orthodontics is not necessary to treat orthodontic cases successfully—mail order diagnosis and treatment, if you please.

The Committee approved an article that was published in *Collier's* in July, 1949. Miss Annette Rich, in the Graduate School at the University of Michigan, has written a splendid article under the supervision of Dr. George R. Moore, Professor of Orthodontics in the University of Michigan, which will undoubtedly appear in one of the lay magazines in the not too distant future. We have had correspondence with a high school boy in Arizona encouraging him to write a thesis on orthodontics. There have been several other minor problems which we do not feel important enough to report at this time.

It is not necessary to call your attention to the fact that the fight against socialized medicine and dentistry is now a responsibility that we can no longer omit from our thinking as individual orthodontists or as citizens who believe in a free American enterprise. As Chairman of the Public Relations Committee, I have contacted as many of the senators and representatives in Washington as possible. There are two pivotal states this year, namely, Ohio and Florida, which all dentists of the United States are watching with a great deal of interest as the future of modern dentistry is at stake. We wish to quote at this time from the Honorable Robert A. Taft, Senator from Ohio, who stated: "I know of nothing which would more extend the powers of the Federal Government into the American home and interfere more with the freedom of the family than the proposals for socialized and nationalized medicine."

It is felt that this Congress is more likely to adopt some type of socialized legislation than any of our previous Congresses. The more conservative element feel, however, that a determined fight would defeat it. This is an off-year election. We have observed during the last two decades that the more conservative element seems to have a better chance of being elected during these off-years. It is necessary, however, that the senators and congressmen be informed of the philosophy of groups such as ours. With that in mind, it was felt that the United States as a whole should have a voice in shaping or recommending to the American Association of Orthodontists a more positive policy. Therefore, the chairmen of the Public Relations Committees of the sectional societies were invited to a breakfast which was held at the Edgewater Beach Hotel, on Monday morning, May 8, 1950, at which time the chairman of the sectional societies gave their reports and from these reports the committee wishes to make the following recommendations:

1. The American Association of Orthodontists goes on record as disapproving the Anti-Trust Division of the Department of Justice in the campaign to discredit American medicine and terrorize physicians and dentists into abandoning their opposition to compulsory health insurance. We believe it to be an outrageous abuse of public power which far transcends in gravity the issues of public health insurance.

2. We wish to recommend that the Public Relations Chairman of each sectional group contact the legislators in their respective districts informing them that the American Association of Orthodontists has gone on record as opposing any form of compulsory health insurance or socialized health services.

3. In the early days of orthodontics there was a very bitter feeling between the men who used various techniques. Through the educational efforts of the American Association of Orthodontists, tolerance has gradually overcome some of this feeling. Everyone knows that one technique may be used with greater efficiency in some individual operator's hands. It is, however, wrong for one orthodontist to criticize another's technique by stating that the particular technique that he uses is the only one by which successful results can be obtained. Everyone agrees that all techniques have their good and bad features. There is no technique which is perfect in all cases. It is poor public relations when orthodontists disagree so violently before the general practitioner. Your Committee recommends that each of you try to be more tolerant. It is well for us to remember the quotation from Abraham Lincoln which Dr. Frank Bowyer of this committee used in a recent paper which he presented before the Southern Society of Orthodontists. I quote: "Let not him who is homeless pull down the house of another, but let him work diligently and build one for himself and thus be assured that his own shall be safe from violence when built."

4. It is recommended that we make every effort to free us from sectional intolerance. Since the days of the automobile and airplane, the United States has become a comparatively small place. In orthodontics it has proved that the

world will beat a path to the door of the man who builds the best mousetrap. Short courses are available covering all the techniques that are now in common use in all sections of our country. Let us remember that the section of the country does not determine the ability of the individual orthodontist. Therefore, when you have a case transfer from your office to another section of the country it is recommended that you refer it with an open mind.

5. "WHEREAS, the American Dental Association has included orthodontic care for children in its national program adopted at its 90th session at San Francisco as one of the services to be rendered on a national, state and community level, and

"WHEREAS, the American Association of Public Health Dentists has passed a resolution approving orthodontic care as a public health service, and

"WHEREAS, the Children's Bureau of the Federal Security Agency recognizes dento-facial deformity as a crippling condition; therefore be it

"RESOLVED, that the American Association of Orthodontists approves orthodontic care as an indispensable part of public health service."

6. The Forsyth Dental Infirmary in Boston, Mass., has a five-year research plan which was approved by the legislators of the State of Massachusetts. Girls with only high school diplomas are matriculated in a course of two years' duration after which time they are permitted to practice children's dentistry. At the end of five years if unsuccessful the graduates revert back to the standing of the dental hygienist.

"WHEREAS, the American Dental Association went on record as disapproving the Forsyth research plan at the 90th meeting of the American Dental Association at San Francisco, be it

"RESOLVED, that the American Association of Orthodontists go on record as disapproving the Forsyth Five Year Plan until it has been given more thorough study.

We all, I am sure, wish to continue under the American philosophy of freedom of initiative. Compulsory health insurance or socialized health services with its accompanying regimentation is not the philosophy we wish to follow. Let us strive for a free America.

Respectfully submitted,

JAMES W. FORD,
FRANK P. BOWYER,
FRED'K R. ALDRICH, Chairman,
Public Relations Committee, A.A.O.

THE REPORT OF THE NOMENCLATURE COMMITTEE OF THE AMERICAN ASSOCIATION OF ORTHODONTISTS, 1950

FOR the greater part of this past year your present Nomenclature Committee was composed of Drs. Kyrles Preis, Will G. Sheffer, and Frank S. Cartwright. On Feb. 15, 1950, Will G. Sheffer died Suddenly at his home in San Jose, Calif. As you all know, Will was Past-President of the Pacific Coast Society of Orthodontists and President-Elect of the California State Dental Association. For the past two years he has given valuable suggestions to the Committee and would have assumed the chairmanship for the ensuing year. In his death dentistry has lost a good friend and a great contributor.

Your committee has not been unmindful of its important task. Our pace has been slower than some might wish for; however, we have tried to answer all correspondence in an expeditious manner. At the First Conference on Dental Library, Indexing, and Nomenclature Problems, held under the auspices of the American Dental Association at Chicago on June 27, 1949, your chairman represented the American Association of Orthodontists. To aid us in our work the committee purchased H. Alan Skinner's *The Origin of Medical Terms,* published by the Williams & Wilkins Company. Consideration has been given to the clarification of some of our most common orthodontic terms.

Your chairman had correspondence from Dr. Ernest Klein, of Denver, Colo., asking for an opinion regarding the words "orthodontia" and "orthodontics." His letter was answered with the following paragraph:

"'Orth' comes from the Greek, meaning 'to set straight.' 'Odontia' is a combining form from the Greek, 'odontos.' 'Ics' is a suffix used in the names of certain sciences as acoustics, mathematics, statistics, politics, pediatrics, etc. Inasmuch as the straightening of teeth is considered a science, the term 'orthodontics' is more in keeping with Webster. For these reasons our association adopted 'orthodontics' to be in keeping with other sciences."

Our next letter came from Dr. J. Camp Dean, Chairman of the Judicial Council, asking for an opinion on the correct use of "dento-facial orthopaedist" and "orthodontist." On Jan. 30, 1950, he wrote the following letter:

"The Judicial Council has a complaint from the President of the Pacific Coast Society of Orthodontists, Dr. Stenson Dillon, which after much discussion seems to be dependent upon the interpretation of which is 'traditional' in nomenclature. Three Los Angeles orthodontists designate their practice as Dento-Facial Orthopaedists, rather than Orthodontists. Are these terms synonymous, If so, which term was first to be used? Dr. Calvin Case's book, published in 1908, was written on the subject of 'Dental Orthopedia.' Dr. Dillon wants a decision by the proper authorities of the A. A. O. as to whether a member of that organization is justified and permitted thus to designate his practice. The office happens to be on the ground floor and has therefore attracted unfavorable comment."

After careful study your chairman answered Dr. Dean on February 10 with the following letter:

"This note is to answer your letter of January 30, relative to the use of 'dento-facial orthopaedics' by certain Los Angeles orthodontists who, I assume, are members of the A. A. of O. It appears to me that your problem may not be one of nomenclature alone, but may involve the Judicial Council as well as the Constitution and By Laws Committee. Dorland's American Medical Dictionary defines these two terms as follows:

"Dental Orthopedics—the correction of deformities or irregularities of the teeth; orthodontia of children's teeth.

"Dento-Facial Orthopedics—the correction of dental malocclusion.

"Now, as you know, 'orthodontics' may be defined as that science which deals with the correction of dental malocclusion. Things equal to the same thing are equal to each other. The deduction would be that the terms are more or less synonymous. I do know that the A. A. of O's former nomenclature committees have considered both of the terms in question to be good form.

"It seems to me there is a terrible state of confusion existing in all our dental nomenclature committees. This confusion helps to confirm my conviction that our dental schools, our societies and the entire dental profession need a good modern dental dictionary with terms defined by philologists and biologists in accordance with other sciences. I have already, at a meeting of the A. D. A. Library and Index Committee, on June 27, at Chicago, suggested and outlined why we must have a dental dictionary. In a recent letter to President Ernst I have asked him to give serious thought on this timely subject in his presidential address.

"The A. A. O. Nomenclature Committees have done a splendid job but they are not in a position to go far enough. Money and full-time competent men must be employed. It may be a five or ten year project. All specialties and the A. D. A. must pool their resources in such a project.

"Now, going back to the contents of paragraph II in this letter, I offer this suggestion: In my opinion it might be advisable for our parent society, the A. A. of O., after deliberation and consideration, to incorporate in the By-Laws that in order to *retain* membership each member must designate himself as an 'orthodontist' or, if the Society prefers, a 'dento-facial orthopaedist.' But let us adopt *one* term and make all use it. I personally would prefer the word 'orthodontist' because it seems to be more in keeping with 'orthodon*tics.*' It is more consistent with the present name of our Society. If we use "dento-facial orthopaedist" we should change the name of our society to "The American Association of Dento-Facial Orthopaedists."

Why not throw this suggestion into an open meeting for discussion, or better, ask President Ernst to incorporate this suggestion in his presidential address? Please let me know your reactions to what I have written. Sincerely yours, signed, Frank S. Cartwright, Chairman, Nomenclature Committee."

The A. A. O. was represented by the chairman of the Nomenclature Committee at the First Conference of Dental Library, Indexing, and Nomenclature Problems, held at Chicago on June 27, 1949. Most of this one-day session was devoted exclusively to indexing and library problems. About one hour was given to the subject of nomenclature but no dental words or terms were defined. Your representative spoke for a few moments on the need for better nomenclature and particularly the need for a good dental dictionary. To give you a clearer account I quote from pages 23 and 24 of the minutes of that meeting.

"Dr. Cartwright complimented Mrs. Robinson on a very excellent paper. He stated that there should be a new approach to this old problem of nomenclature which had so long caused confusion in dental education fields. Dentistry has become a full-grown science. It needs a dictionary. This would not be a short-range project, but rather one requiring perhaps ten years to complete. He said there was a vital need for such a dictionary and asked the general secretary's permission to throw this request into the hopper with the others already made. He suggested that it might be financed by assessing each member an additional fifty-cents to start the ball rolling. This fund of perhaps $40,000.00 might be used to set up a preliminary dictionary committee to investigate the matter, employ philologists, biologists and others who really know something about defining words. He cited the difficulty, encountered by a former chairman of an orthodontists' group appointed to study their own nomenclature, in obtaining satisfactory replies from dental groups, as terms seemed to carry different connotations in various sections of the country. Once the preliminary committee above-mentioned reaches a decision and makes a report, a conference can be held with members of various specialty groups. It will, however, be necessary for the A. D. A. to set up the original authority. After such a start has been made, where would more money come from? He believed the assistance might be had from dental associations, foundations, and gifts from various dental schools. He offered these suggestions as a starter to an approach to a better nomenclature."

As mentioned in the early part of this report, we have redefined a few of our most common orthodontic terms, and wish to submit them to the membership for consideration, appraisal, and study. For some of these definitions we are indebted to a few of those men who so willingly answered our former chairman's letter to heads of the various graduate and undergraduate orthodontic departments in dental schools throughout this country and Canada. In this letter he asked for a list of orthodontic words or terms which are most in need of clarification and also asked their definitions. We list the following seven definitions for your approval or rejection:

1. *Ideal occlusion:* Basically a myth; it is a figment of the imagination.

2. *Normal occlusion:* Signifies the type of occlusal contact that helps to maintain the health of the supporting structures of the teeth and favors the physical and mental adjustment of the individual.

3. *Overbite:* The degree of vertical extension of the maxillary anterior teeth over the mandibular anterior teeth.

4. *Anterior cross-bite:* That condition in which the incisal edge of a maxillary tooth occludes lingually to the incisal edge of a mandibular anterior tooth.

5. *Posterior cross-bite:* That condition in which the buccal cusps of a maxillary posterior tooth occlude anywhere between the buccal and lingual cusps of opposing mandibular tooth or teeth.

6. *Complete buccal relation:* That condition in which the position of a maxillary or mandibular posterior tooth is such that its lingual cusps are buccal to the buccal cusps of its opponent or opponents.

7. *Complete lingual relation:* That condition in which the position of a maxillary or mandibular posterior tooth is such that its buccal cusps are lingual to the lingual cusps of its opponent or opponents.

In closing we wish to emphasize the great need for a nomenclature committee. We are aware that we have not scratched the surface in an attempt to help in the clarification of dental terms. It is a long, tedious job. It might be well if our society gave more serious consideration to the publishing of a good dental dictionary—one that will be acceptable to all dental schools, deans, professors, editors, and the profession. We recognize that this project might take thousands of dollars and years of hard work. Competent full-time men must be employed. By joining hands with all other specialties we might evolve a dictionary that will do honor to dentistry and save posterity from the present-day dental nomenclature confusion.

Respectfully submitted,

WILL G. SHEFFER,†
KYRLE PREIS,
FRANK S. CARTWRIGHT, Chairman.

†Deceased Feb. 15, 1950.

THE REPORT OF THE PUBLIC HEALTH COMMITTEE OF THE AMERICAN ASSOCIATION OF ORTHODONTISTS, 1950

THE Committee was invited by the Bureau of Public Relations of the American Dental Association to cooperate with them in the preparation of a brochure on "Questions and Answers in Orthodontics," for distribution to the public. The Committee carried on extensive correspondence in the course of this work and fully cooperated with the A. D. A. to bring the undertaking to a successful completion. This brochure is scheduled for early publication and distribution by the American Dental Association.

The Committee is currently cooperating with the Bureau of Dentistry, of the Department of Health of the State of New York, in the preparation of a manual on "Preventive Orthodontics," for distribution to dentists. This manual will be available to dentists in all States. The publication of the manual is being undertaken with the cooperative assistance of the Children's Bureau of the Federal Social Security Agency in Washington.

The Committee has kept in touch with the Public Relations Committee of the American Association of Orthodontists and advocates the continuance of such cooperation in the future. The Committee advises continued cooperation with the A. D. A., the American Public Health Association, the American Public Health Dentists' Association, the Mid-Century Conference on Child Health, and other official and unofficial agencies interested in orthodontics as a public health activity.

At a joint meeting of the Public Health Committee and the Public Relations Committee of the A. A. O., the following resolution was drafted for your consideration and adoption by the Society:

WHEREAS, The A. D. A. has included orthodontic care for children in its National Program, adopted at its ninetieth session at San Francisco, as one of the services to be rendered on a national, state, and community level, and,

WHEREAS, The American Association of Public Health Dentists has passed a resolution approving orthodontic care as a public health servce, and,

WHEREAS, The Children's Bureau of the Federal Security Agency recognizes dentofacial deformity as a crippling condition. Therefore,

BE IT RESOLVED, That the A. A. O. approves orthodontic care as an indispensable part of Public Health Service.

Respectfully submitted,

B. HOLLY BROADBENT,
HERBERT K. COOPER,
LEIGH C. FAIRBANK,
L. BODINE HIGLEY,
GEORGE R. MOORE,
J. A. SALZMANN, Chairman.

THE COMMITTEE REPORT ON CERTIFICATION OF SPECIALISTS, AMERICAN ASSOCIATION OF ORTHODONTISTS, 1950

LEGAL certification of dentists who are limiting their practices to some branch of dentistry is now operating in Illinois (1933), Oklahoma (1935), Tennessee (1935), Michigan (1941), Kansas (1943), and South Carolina (1945).

A report of a survey two years ago enlightens us as to the status of certification by legal statutes. The survey was designed to bring out impartially favorable and unfavorable opinions as to the desirability of state laws to govern special practices in dentistry and to report the results of the operation of such laws. By their reports on the questionnaires and the opinions set forth in accompanying letters, the consultants gave practically unanimous approval of the operation of laws regulating special practices in dentistry.

In general an analysis of their remarks supports the following statements of their beliefs as of that date:

1. The improved dental curriculum offers a better educational background for specialization; however, such improved standards alone do not qualify a dentist as a specialist, according to the standards of measurement of the public and the profession.

2. Specialists' laws do not necessarily qualify one as a finished specialist any more than our regular dental acts qualify one as an expert dentist, and such higher standards can be attained only after years of study and experience in practice.

3. The purpose of regulatory laws is to set up adequate minimum requirements so that dentists qualifying as specialists will be capable of rendering service with safety to the public.

4. It is not the purpose of these laws to raise the requirements to the extent that the cost of education and the length of time required for training would automatically reduce the number desiring to limit practices, thereby defeating one of the purposes of special practices—that of delivering better service to the greatest number.

5. Complete regulation of the practices of specialists to protect the public is possible only through certification by state statutes; standards of schools and boards, both professional and state, have no direct effect or influence on the unprepared or the misfit if he wishes to practice as a specialist in those states having no regulatory laws.

6. Legal certification does not interfere in any way with the general practice of dentistry or its progress in general. A dentist in the aforementioned states has as much freedom of expression and action in the practice of dentistry as he had before the passage of these acts. He may practice all phases of dentistry and become expert and skillful in any branch. His regular license grants him that right. However, if he dishes to specialize in any given branch of dentistry, he may do so by presenting his qualifications to the state examining board for its consideration and action.

7. The public is now being better served in the six states by licensed specialists than it was before the enactment of the specialists' laws, stating that such laws serve to improve the standard of practices.

8. Of the number applying for certificates in the six states, 22 per cent either failed to qualify for the examinations or failed their examinations. Some of those who failed further prepared themselves and have been certified. No further report was given about those who failed.

9. According to the survey many dentists desire to specialize who are wholly unprepared to perform adequately the services expected of a qualified specialist; only by regulatory laws can a dentist be prevented from representing himself as a specialist.

10. A dentist need not apply for recognition as a specialist until a law so requires.

11. An examining board at present has no authority to question the right of a dentist to practice as a specialist in any branch of dentistry without the authority of such a law if he adheres to the Code of Ethics of the A. D. A.

12. By their laws the Boards in the six states have the right to ask a dentist who claims to have special knowledge and wishes to practice as a specialist to present and support his qualifications in a reasonable test.

13. A state has the sole right and duty to regulate with justice the relationship of its citizens within its borders, and state officials recognize the legal certification of specialists as an effort on the part of the dental profession to accept its public responsibility by endeavoring to meet the demand for special services in certain branches of dentistry.

14. The legislative process is the democratic way, for it is one in which dentists and the public within their respective states actually participate. The proposed act must have the endorsement of the dental profession and the elected representatives of the people. The public should not be denied its sovereign rights to participate in the establishment of health policies which affect the people. The public should also have recourse for the correction of any abuses of power by regulatory boards. This plan breaks the system down into state units, whereby methods of operation may be observed and changed according to the needs of the public and the profession. Certification is but another progressive change suggested to cover this newer phase of dental practice.

15. The dental board officials report that applicants are today better prepared for limiting their practices than were the dentists who limited their practices prior to the enactment of the specialists' laws; certification by national specialty boards would not afford protection to the public of their respective states without their existing laws certifying specialists, because of the lack of authority or of a policing agency; officials would not be satisfied to nullify the present specialists' clause of their respective dental acts in the light of the proposed certification by national boards.

16. State laws with their periodic adjusting of requirements are a positive force in elevating all levels of professional practices, whether general or special.

17. Any state certifying specialists must be reasonable in its demands for adequate requirements for the practice of specialists with safety to the public. Legislators are interested in better services to a greater number. It would be natural for them to regard unreasonably high standards as too costly and tending to limit the number in special practices and the amount of services rendered.

18. State laws are of local as well as of state interest. Dentists who wish to specialize are stimulated to make an effort to meet the requirements of the specialists' laws. Having met the requirements of the board, a specialist is immediately accepted by the profession of the state as qualified to practice with safety to the public. He is also legally recognized and can accept references with dignity, confidence, and self-respect.

If special practices in dentistry are to reach their peak in knowledge and service, certification by state statute must have first consideration. Because of the length of time and the cost involved in meeting the present requirements, more dentists who aspire to become specialists can more clearly see the consummation of their plans; first, by states for legal certification; and second, by national specialty boards for professional recognition.

19. The operation of the specialists' laws has proved generally satisfactory to the public and the profession; there have been no court tests and no amendments have been proposed.

20. These laws have had the desired results in protecting the public from the unprepared, the misfit, and the pseudospecialist, because state laws are effective and are supported with authority and policing agency.

21. Finally, probably not all who are legally certified, but a great many, no doubt, will make plans for meeting the requirements of the national specialty boards. If a dentist should not desire certification by a national board, or if, by chance, he should fail to meet the requirements, the public would still be protected, for he already would have been certified as a specialist by his state board. Thus, both the public and the profession would be best served through the two systems of certification. Certification by state statue could very well serve as a stimulus to higher attainment and recognition and become a developing field for the certification by national boards. Therefore, the quantity and the quality of services of specialists in dentistry would progressively be raised to a higher plane by which both the public and the profession would be benefited.

CONCLUSIONS

The foregoing facts and opinions reveal by the preponderance of evidence that:

1. The principle and the purpose of the laws certifying specialists in dentistry have been upheld.

2. The experience of the six states having these laws supports the conclusions that the public should have the benefits and the protection of laws providing for legal certification of specialists, and that these laws have earned and deserve a rightful place in state dental acts.

This Committee recommends that a committee of three be appointed by the Board of directors of the American Association of Orthodontists and two from the American Board of Orthodontics to draft the practical features necessary for a uniform specialty law for the various states.

Respectfully submitted,
OREN A. OLIVER,
OLIVER W. WHITE,
W. E. FLESHER, Chairman.

Department of Orthodontic Abstracts and Reviews

Edited by
Dr. J. A. Salzmann, New York City

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York City

Blakiston's New Gould Medical Dictionary: Editors, Harold Wellington Jones, M.D., Normand L. Hoerr, M.D., and Arthur Osol, Ph.D., with the cooperation of an editorial board and 80 contributors. 252 illustrations on 45 plates, 129 in color. First edition. Philadelphia, Toronto, The Blakiston Company, 1949. Price, $8.50.

The publishers claim that this is the first completely new, unabridged medical dictionary in thirty-eight years. It is compiled by an editorial board which includes outstanding medical teachers and practitioners. Among the contributors to the dictionary is B. Holly Broadbent of Western Reserve University, whose contribution is on orthodontic terminology. Thomas J. Hill, Professor of Clinical Oral Pathology and Therapeutics, School of Dentistry, Western Reserve University, is the contributor on oral pathologic terms.

More than three hundred modern texts and journals were critically examined for new words and changes of usage. A wide range of dental and orthodontic terms have been included. Colored plates have been included on "The Development of the Human Deciduous and Permanent Dentitions" and on "Skeletal Development."

Terms relative to developments in atomic energy and the isotopes have been included. In addition to the listing of medical and dental terms, the appendix includes anatomic tables on blood constituents, medical science and symbols, prescription writing, and weights and measurements.

Gould's dictionary in the present edition has been developed to its highest status. It is worth the price and much more.

News and Notes

American Association of Orthodontists

It is not too soon to be making plans to attend the next annual meeting of the American Association of Orthodontists which will be held in Louisville, Ky., April 23, 24, 25, and 26, 1951.

We have been very fortunate in obtaining the use of two good hotels—the Seelbach and the Kentucky. These hotels are in the same block on the same side of the street and are practically connecting. Although the Kentucky is the newer hotel, the Seelbach will be headquarters because of the larger auditorium.

Please do not write directly to the hotels. You are requested to write to Dr. John A. Atkinson, 896 Starks Bldg., Louisville, Ky., Chairman of the reservations. Since each hotel is equally desirable, the rooms will be allocated to the hotels as the reservations come in.

Joseph E. Johnson, President.

American Board of Orthodontics

The 1951 meeting of the American Board of Orthodontics will be held at the Seelbach Hotel in Louisville, Ky., April 18 through April 22, 1951. Orthodontists who desire to be certified by the Board may obtain application blanks from the Secretary, Dr. C. Edward Martinek, 661 Fisher Bldg., Detroit 2, Mich. Applications must be received not later than March 1, 1951, for consideration at the Louisville meeting.

Central Section of the American Association of Orthodontists

The 1950 meeting of the Central Section of the American Association of Orthodontists will be held November 26, 27, and 28 at Cedar Rapids, Iowa.

Northeastern Society of Orthodontists

The fall meeting of the Northeastern Society of Orthodontists will be held at the Shoreham Hotel, Washington, D. C., Nov. 6 and 7, 1950.

Southwestern Society of Orthodontists

The next meeting of the Southwestern Society of Orthodontists will be held Oct. 15, 16, 17, and 18, 1950, at Hotel Frances, Monroe, La.

Great Lakes Society of Orthodontists

The twenty-first annual meeting of the Great Lakes Society of Orthodontists will be held at Hotel Statler, Detroit, Mich., Nov. 19, 20, 21, and 22, 1950.

Rocky Mountain Society of Orthodontists

The Rocky Mountain Society of Orthodontists will hold its fall meeting in Denver, Colo., Nov. 6 and 7, 1950. The program follows:

Registration—Clinic room, Rocky Mountain Metal Products Co., 1450 Galapago St., Denver, Colo.

Harry V. Banks, Denver, Colo., Fabrication of Upper Removable Appliance for Moving Posterior Teeth Distally.

Curtis E. Burson, Denver, Colo. Removable Appliances.

Round-table luncheon. Denver Athletic Club.

Curtis E. Burson, Denver, Colo. Removable Appliances.

E. H. Mullinax, Pueblo, Colo. Your Dollar and Mine.

Harry V. Banks, Denver, Colo. Fabrication of Lower Removable Appliance for Moving Posterior Teeth Distally.

Round-table discussion. Denver Athletic Club.

Archie B. Brusse, Denver, Colo., and Elmer S. Linderholm, Denver, Colo. Management of Chrome Alloy. Kodachrome movie and clinical demonstration.

Southern Society of Orthodontists

Under the direction of President Lunsford and committees an advance newsletter from the Southern Society of Orthodontists reveals the following plans in regard to the Southern meeting, Nov. 15, 16, and 17, 1950.

ON MIAMI SHORES

As you know the next annual meeting of the Southern Society of Orthodontists will be held at the beautiful Sherry-Frontenac Hotel, Miami Beach, Fla., on Wednesday, Thursday, and Friday, Nov. 15, 16, and 17, 1950. This magnificent hotel, the largest and one of the newest on the ocean in Miami Beach, enjoys a reputation for unparalleled service, incomparable accommodations, and superb cuisine. Here you can combine the meeting with a dream vacation in one of the world's most luxurious hotels.

Reduced European plan rates will be in effect for our meeting.

Air-conditioned double rooms with twin beds	$8.00 daily
Air-conditioned single rooms	$6.00 daily

Rates for living room-bedroom suites and the American plan are available upon request.

The following accommodations will also be available for us:

For our scientific meetings—air-conditioned conference rooms.

For our dining pleasure—the Parisian Room, the Ocean Terrace Room, and the Outdoor Pool Deck Patio at the ocean's edge.

For our entertainment—the glamorous Pompadoour Room, the Night Club, and the Caprice Cocktail Lounge.

Advance reservations are larger at this time than ever before in our history. *If you have not made your reservation please do so immediately.* For any additional information about the Sherry-Frontenac or your reservation contact Mr. B. Burke, Managing Director.

SCIENTIFIC PROGRAM

A most practical, beneficial, and helpful program has been arranged. The questionnaires previously sent to the membership were carefully surveyed and the kind of program, the essayists, and clinicians *you* requested have been obtained for you. Realizing that you might like to know just what is in store for you, I have obtained permission from the Program Committee to give you this advance "Scoop" on the program. The committee, con-

sisting of Drs. Walter T. McFall, Leigh Fairbank, and Leland Daniel, has worked hard and long on this year's program and certainly deserves our gratitude. We can show it in no better way than by attending all sessions and being there on time so that they can keep this very full program running smoothly and on schedule.

Dr. Walter T. McFall, Chairman of Essayists, reports:

Very much interest has been shown by our membership in the excellent work being done with precious metal removable appliances by Drs. George Crozat and Samuel D. Gore, of New Orleans. After much persuasion they have consented to present "Construction and Discussion of the Uses of the Precious Metal Removable Appliances." They plan to discuss the indication, uses, fabrication, advantages, history, philosophy, and other phases of the appliance. They will use slides showing the construction of the appliances and treatment of cases. They will have a question and answer period and will welcome your questions and discussion. Come prepared to be amazed at the wonderful results these men are obtaining with their technique.

Dr. W. M. Krogman, from the Child Growth Center of the University of Pennsylvania, will be with us to continue his most interesting and helpful discussions of "To Treat or not to Treat," and also the newest developments in "Roentgenographic Cephalometry as a Tool in Growth Research and Orthodontic Analysis." Those of you who heard Dr. Krogman in New Orleans are responsible for having us bring him back again this year. Those of you who have not heard him certainly have a treat in store and will carry away information that you will find most adaptable to your everyday practice.

At the request of the Research Committee Dr. Hal Terry will present a report on "The Temporomandibular Joint in Guide Plane Cases." Hal has devoted a great deal of time and effort to this study. He has some scientific data that has commanded the interest of many outstanding physicians and dentists in the country who are doing research on the temporomandibular joint. We are proud that one of our members is doing such fine research work and we are looking forward to hearing him present his findings.

Dr. Leigh C. Fairbank, Chairman of Case Histories, reports:

The assortment of case histories which will be presented I believe will add much to the value of the program. There are both young men and older members who will contribute to this part of the program. In keeping with Jeff's desires, I have endeavored to have the case reports represent recent accomplishments of members in which the various accepted methods of treatment have been used. It is anticipated that these case reports will be most helpful to the entire membership and will offer helpful solutions to problems common in every practice.

1. Treatment of a Class I Case With the Twin-Wire Appliance, Following the Extraction of Four Premolars. Dr. Neil J. Leonard, Memphis, Tenn.
2. Meeting Some of the Problems of Open-Bite Cases During Treatment. Dr. Andrew Francis Jackson, Philadelphia, Pa.
3. The Occlusal Guide Plane as an Adjunct to the Labiolingual Technique. Dr. William H. Oliver, Nashville, Tenn.
4. Treatment of a Class II Case With the Edgewise Mechanism, Following the Extraction of Four Premolars. Dr. Sam Fennell, Augusta, Ga.

Dr. Leland Daniel, Chairman of Table Clinics, reports:

We have had a good response to our request for table clinics. There probably will be more by meetingtime, but to date we have the following:

Dr. Faustin N. Weber, Memphis, Tenn.
Dr. Amos S. Bumgardner, Charlotte, N. C.
Dr. Steve Hopkins, Washington, D. C.
Dr. Clyde Wells, Spartanburg, S. C.
Dr. Andrew F. Jackson, Philadelphia, Pa.
Dr. Robert Litowitz, Miami Beach, Fla.

Dr. William A. Parker, Knoxville, Tenn.
Dr. James C. Brosseau, Baton Rouge, La.
Dr. Ross Williams, Birmingham, Ala.
Dr. Olin W. Owen and Dr. Henry C. Harrelson, Charlotte, N. C.

HAVANA TRIP IS BOOKED TO CAPACITY

Mr. E. M. Baskett, of the P. & O. Steamship Company, advises us that the post-convention trip to Havana is booked to capacity and he has a waiting list of approximately three hundred. He regrets that he must request all of those who are holding reservations *To pay in full immediately* in order definitely to hold their accommodations. If, in case of emergency, cancellations are necessary, he assures us that refund of the full amount will be made promptly. Mr. Baskett intends to send to the membership a letter giving more details of this unavoidable situation.

Air Force to Commission Medical Professional Women

Women physicians, dentists, veterinarians, as well as technical specialists for duty in the Medical Service Corps may now receive reserve commissions in the Air Force, and may apply for extended active duty at Air Force installations.

The provisions are similar to those announced for the Department of the Army on August 28.

Women so commissioned will receive the same pay and allowances as male officers. The grade in which they will be appointed will also be based on the same considerations of age and professional qualifications as male officers. The grades will range from first lieutenants to colonel.

Women physicians will be eligible to participate in the Air Force-sponsored civilian intern program under which physicians receive the pay and allowances of a first lieutenant in the Air Force while completing their internship at civilian hospitals with the understanding that they will serve on active duty for two months for every month spent as an Air Force-sponsored intern in the civilian hospital.

To be eligible for reserve commissions, women physicians, dentists, veterinarians, and Medical Service Corps specialists must hold appropriate degrees from accredited schools approved by the Surgeon General, United States Air Force. They must be citizens of the United States. They may be married, but may not have dependents less than 18 years of age.

Further information and application blanks may be obtained upon written request from the Surgeon General, Headquarters, U. S. Air Force, Washington 25, D. C.

Army to Recall 343 Dental Reserves

The Department of the Army announced on August 17 that 343 Dental Corps Reserve officers will be recalled to active duty not later than October 1, with most coming on duty in September.

In addition to dentists, 734 physicians, 455 Medical Service Corps, and 50 veterinarians will be recalled, making a total of 1,582 reserve officers of the four male corps of the Army Medical Service.

Two major phases of the recall are expected to result in a minimum of dislocation to civilian health services and assurance of appropriate assignments to all those entering active duty. First, recall quotas assigned to each of the six Army areas in the United States have been based on professional population rather than the number of reserve of-

ficers in the area. Thus, Army areas with the smallest proportion of dentists to the civilian population will have the smallest quotas, regardless of the relative reserve officer strength. Second, quotas for Army areas also specify grades and special skills required. Officers will be recalled in their present Reserve grades.

The total number of Dental Corps Reserve officers to be recalled, by specialty, include: General Practitioners, in the grades of first lieutenant and captain, 285; Oral Surgeons, 29; Prosthodontists, 29. The latter two categories will include ranks from first lieutenant through lieutenant-colonel.

Distribution breakdown by Army Area will be as follows: First Army (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New Jersey, Delaware, and New York), General Practitioners, 81; Oral Surgeons, 8; Prosthodontists, 8.

Second Army Area (Pennsylvania, Maryland, Virginia, Ohio, Kentucky, West Virginia), General Practitioners, 57; Oral Surgeons, 6; Prosthodontists, 6.

Third Army Area (North Carolina, South Carolina, Georgia, Florida, Alabama, Tennessee, Mississippi), General Practitioners, 27; Oral Surgeons, 3; Prosthodontists 3.

Fourth Army Area (Texas, Oklahoma, New Mexico, Arkansas, Louisiana), General Practitioners, 20; Oral Surgeons, 2; Prosthodontists, 2.

Fifth Army Area (Illinois, Iowa, Michigan, Missouri, Wisconsin, Kansas, Minnesota, Nebraska, North Dakota, South Dakota, Indiana, Wyoming, Colorado), General Practitioners, 81; Oral Surgeons, 8; Prosthodontists, 8.

Sixth Army Area (Washington, Oregon, Idaho, Montana, Utah, Arizona, Nevada, California), General Practitioners, 19; Oral Surgeons, 29; Prosthodontists, 29.

The Army will continue to make every effort to obtain volunteers for twenty-one months' service to fill requirements. Volunteers will be credited to the quota of the Army area in which they reside.

On Aug. 4, 1950, 1219 letters from Major General Walter D. Love, Chief Dental Division, Army Surgeon General's Office, were sent out appealing for Reservists in the grades of lieutenant, captain, and major to volunteer. As of August 18, 31 had volunteered for active duty.

One major advantage accruing to volunteer physicians and dentists will be an additional $100 monthly professional pay. Under the legislation authorizing this additional pay, it may go only to volunteers.

Priority for involuntary recalls to meet quotas will be given to Reserve officers with the least active duty service. Thus, Reserve officers with considerable wartime service will normally be among the last called. However, in many cases the operation of the priority system will depend on the number of Reserve officers available in a given specialty. Reserve officers who are members of Organized Reserve units which have not been alerted or scheduled for an early alert may be subject to individual call.

Delay has been authorized in calling up five categories of Army Medical Service Reserve officers. These are:

1. Reserve medical officers, who have not completed one year's internship.
2. Senior medical and dental residents until completion of their current year's training.
3. Reserve officers enrolled in full-time postgraduate courses in medicine, dentistry, or other closely allied sciences at a recognized institution of higher learning until completion of their current academic year.
4. Reserve officers engaged in essential teaching, research, and allied endeavors.
5. Reserve officers whose recall would unduly jeopardize the health of a community.

Authorization for delays under any of these categories will be granted by military district commanders.

Army commanders have been directed to enlist the assistance of state and local dental, medical, and veterinary societies, as well as that of senior Reserve dental, medical, and veterinary officers.

Federal Security Agency, Children's Bureau

Tens of thousands of children will have greater chance for good health and care when the $19.5 million increase in grants to States, under the 1950 amendments to Title V of the Social Security Act, get into operation, Katharine F. Lenroot, Chief of the Children's Bureau, predicts. The amendments authorize funds nearly double the amount currently available, from $22 million to $41.5 million.

These amendments authorize Congress to increase annual grants for State and local maternal and child health services from $11 to $16.5 million; for services for crippled children, from $7.5 million to $15 million; and for child welfare services, from $3.5 to $10 million. (For the remainder of the current fiscal year, authorization for maternal and child health services would be limited to $15 million, and for crippled children's services, to $12 million.) Appropriations for the current fiscal year have not yet been made.

When increased funds become available, on the basis of preliminary information, the States plan to start or extend existing programs, among others, for children with rheumatic fever, epilepsy, cerebral palsy, hearing handicaps, and for saving premature babies.

With increased grants, State child welfare agencies hope to provide better shelter care of children in emergency situations; better service for babies available for adoption, and more services to help banish the "black market" in babies; improved services for unmarried mothers; protection for runaway children; more extensive homemaker services; and good foster family care for children now held in jails while they await court action.

Due to rising costs and inadequate funds, State health and welfare agencies have been forced this year to curtail some of their established programs of service. Larger grants are expected to help these agencies reopen doors they have had to close to children.

States will be planning expansion of their programs in close cooperation with private agencies and citizen groups in the child health and welfare fields.

To qualify for Federal aid, States must put up money of their own. Each State's share in the total for each program is worked out by various formulas, all of them intended to strengthen the development of services for rural children.

"The 1950 amendments reaffirm the basic principle in the original 1935 Social Security Act," Miss Lenroot commented. "That act stated: 'The heart of any program for social security must be the child. All parts of the Social Security Act are in a very real sense measures for the security of children.' The Act recognized that many children need the help of doctors, nurses, social workers, and other skilled people, as well as family economic security, if they are to have the chance to grow as happy, healthy individuals.

"Title V of the Social Security Act also is based on the sound democratic principle that the best way to develop children's services is to move ahead when and where people are ready to go, and not to impose a single pattern on the Nation.

"Each State develops its own plan for using Federal grants, taking into account all available resources whether under private or public auspices. As a result no two State plans are alike. For this reason, it is impossible to predict exactly which children and how many of them will benefit from the increased grants under the 1950 amendments. The fact that there will be many thousands who will be helped is seen clearly from the reports from the States for the year 1949, when much smaller Federal grants were available."

During that year, with the help of Federal funds, more than 200,000 crippled children were reached by professional services of doctors, nurses, medical social workers, physical therapists, or other workers. Over 231,000 neglected, dependent, or delinquent children received social services from child welfare workers in public agencies, including workers paid from Federal funds and those paid entirely by State and local funds.

Under Federal-aided maternal and child health services, over 683,000 infants and preschool children attended well-child clinics; doctors completed 2,246,000 examinations of school children; over 1,500,000 children were immunized against smallpox and diphtheria; and some 168,000 expectant mothers attended prenatal clinics.

"To all parents and professional workers with children the increases made possible by the 1950 amendments are heartwarming," Miss Lenroot added.

"Never was it more important than at the present to give every child the chance to grow as a healthy and socially responsible human being. The world that we are passing on to the next generation is a more complicated and difficult world than any previous generation has had to face. Our children deserve the best we can give them to increase their physical, emotional, and social wellbeing and develop their greatest individual potentialities.

"Welcome as the extra $19.5 million will be, none of us can blind himself to the fact that there will still be many children in need of health and welfare services who cannot be reached even by expanded State and local services. We need constantly to assess the extent to which children are reached by the services they need, and what it takes to make good on our obligations to them."

The Social Security Act, first passed in 1935, established the principle that all the people of the United States, through the Federal Government, share with State and local governments responsibility for helping to provide community services that children need to have a good start in life. To back up this principle, the Social Security Act authorizes Congress each year to appropriate funds to be given to the States to help them extend and improve their health and welfare services for children and maternity services for mothers.

What annual grants are authorized by the 1950 amendments?

$16.5 million for maternal and child health services ($15 million for the balance of the 1950-1951 fiscal year).

$15 million for services for crippled children ($12 million for the balance of the 1950-1951 fiscal year).

$10 million for child welfare services.

Is this much of an increase?

These sums represent substantial increases. Under 1946 amendments to the Social Security Act, annual grants for the past four years have been:

$11 million for maternal and child health services.

$7.5 million for services for crippled children.

$3.5 million for child welfare services.

When the Social Security Act was first passed in 1935, annual grants authorized were:

$3.8 million for maternal and child health services.

$2.85 million for services for crippled children.

$1.5 million for child welfare services.

Who administers these grants to the States?

The Children's Bureau administers these grants under the authority delegated by the Social Security Administration of the Federal Security Agency.

Is any of this money paid to children or their parents?

No. All of it goes to official State agencies, to be used in paying the cost of child health and welfare services. The great bulk of it pays salaries of doctors, nurses, medical social workers, nutritionists, physical therapists, child welfare workers, and other professional workers for children. Much of the money for crippled children pays the cost of medical, hospital, and convalescent care. Some of the child welfare money will help to pay the cost of foster care for children who cannot be cared for at home.

What State agencies receive this money?

Maternal and child health funds go to State health departments. Crippled children's funds go to State crippled children's agencies, some 33 of which are in State health departments. Child welfare funds go to State welfare departments.

Do all States share in this money?

All States, the District of Columbia, Alaska, Hawaii, Puerto Rico, and the Virgin Islands receive grants-in-aid for all three of these programs. (The term "States" in this Fact Sheet covers all.)

How is the money divided among the states?

In all three programs, emphasis is given to building services in rural areas. Each State receives a flat amount for each of the three programs. The balance of the Federal funds is apportioned to the States on the basis of various factors as follows:

In the case of the $16.5 million for maternal and child health services, each State's share is affected by the number of its live births in relation to the total number of live births in the country, by the State's need for help in providing services, and by its rural child population.

States share in the $15 million for services for crippled children largely according to the number of children under 21 years of age. Their share also reflects the financial need of each State for help in carrying out their programs, and their relative number of rural children.

Each State's share in child welfare grants is affected by the proportion of its rural population under 18 to the total rural population.

What must States do to qualify for funds?

In all three programs, State agencies must present plans for spending Federal grants that meet the requirements of the Social Security Act and assure good quality of service. This plan is approved by the Children's Bureau. At the end of each year State agencies must report how they spent the money.

To take full advantage of the $16.5 million of maternal and child health funds, and the $15 million of crippled children's funds, States must match half of the Federal grants, dollar for dollar.

To take advantage of the child welfare funds, each State must assume some of the cost of services in local areas, although no fixed amount of Federal funds must be matched.

Are States free to work out their own plans in their own way?

So long as States meet the requirements of the Social Security Act, they are entirely free to use Federal funds in the way they think best. As a result, no two State plans are alike. This is one of the great strengths of these grant-in-aid programs: they preserve and respect State and local initiative.

Does the Social Security Act place any residence or income restrictions on which children may get the benefits of federally-supported services?

None whatsoever. The States themselves decide who is eligible for services under certain general policies laid down by the Federal government. For example, under the Constitution, the Children's Bureau cannot approve a State plan that discriminates against children of any race.

Are States limited in what they do for children to the amount required for matching federal funds?

Many States spend a great deal more of their own money than the amount they must promise to spend in order to get Federal funds.

What are maternal and child health services?

Most of the services provided by State and local health departments for mothers and children are health promotion services: that is, they are designed to help well mothers and children keep well. Typical health promotion services are: prenatal clinics, visits to homes by public health nurses; well-child clinics; immunization services; medical and dental services for children of school age. Some States also provide treatments for sick mothers and children, but this is done in a very limited way for relatively few. All States use some of their funds for the training of professional personnel needed to provide these services.

What are services for crippled children?

All States operate diagnostic clinics where a child with a handicapping condition can be brought for a free diagnosis. Within the limits of their funds, all States provide skilled treatment for some children which includes medical care, hospitalization, and convalescent care. Children most generally helped by State crippled children's agencies are those needing orthopedic or plastic treatment. But most States do something also for children with other crippling conditions, such as rheumatic fever, polio, cerebral palsy, epilepsy, and hearing defects.

What are child welfare services?

Child welfare services are social services for children. They are usually provided by child welfare workers in local communities. The first concern of these workers is to strengthen family life. Consequently, they help children with a wide variety of problems who are living in their own homes. They help children who are having difficulty in getting along with others. They help unmarried mothers and babies born out of wedlock. They help children who are being neglected or abused. When children cannot receive the care they need in their own homes, the child welfare workers help to make other plans for their care, either in foster-family homes or in institutions. They place children for adoption when it has been determined that the child must be permanently removed from his own home. They find day care for children of working mothers. They help to improve State laws governing adoptions, guardianship, support, and work with public and private organizations in building better community conditions for children.

How many children are helped by maternal and child health services?

In 1949, when Federal grants for these services amounted to $11 million, over 683,000 infants and preschool children attended well-child clinics. Doctors made 2,246,000 examinations of school children. Over 1,560,000 children were immunized against smallpox; 1,547,000, immunized against diphtheria. Some 168,000 expectant mothers attended prenatal clinics during pregnancy, and 56,000 received medical examinations after delivery. All such services were financed, at least in part, by Federal funds. Figures here do not include maternal and child health services financed entirely with State or local funds.

How many children are helped by crippled children's services?

Again, in 1949, when Federal grants were $7.5 million, over 200,000 children received some kind of professional services. Nearly 80,000 crippled children were reached for the first time. Some 150,000 received diagnostic or treatment services at clinics. About 35,000 were hospitalized. Some 5,300 received convalescent home care.

How many children are helped by public child welfare services?

Over 231,000 children received child welfare services in 1949. Many of these children were served by workers paid entirely from State and local funds. Children helped by Federal funds, which in 1949 were $3.5 million, were largely in rural areas. Forty per cent of all 231,000 children were living with their parents or other relatives; 42 per cent were in foster-family homes; 18 per cent were living in children's institutions or elsewhere.

How many children needing health care are not getting it?

Nobody knows how many children throughout the Nation are not getting the health services that they need, but we have a few indications of the great need for more services:

Over 110,000 babies die each year, many of them needlessly. A third of these babies is born prematurely; with good care many thousands of them could be saved. (Premature birth is the leading cause of death in the first year of life and eighth leading cause at all ages.) Only 11 States now have programs under State agencies, serving limited areas, that provide medical and hospital care of premature babies. This is a very costly service which pays off in saving lives.

The death rate of nonwhite children aged 1 through 4 is 67 per cent higher than the white rate, and of nonwhite children aged 5 through 14 it is 40 per cent higher than the white rate. These rates need to be slashed drastically.

Some 100,000 children, 10 years or younger, are believed to have congenital syphilis. A major offensive is needed against this disease which is almost certainly preventable and curable when measures are taken in time.

Some 175,000 children have cerebral palsy. With proper care, a high percentage of them can live useful and independent lives. Cost of such treatment and training is extremely high, and few families can afford it. Only a few States have been able to take even first steps toward developing programs for these children.

Some 200,000 children have epilepsy. Many of them are kept out of schools. Science has recently perfected medicines that control or greatly reduce seizures. Every one of these children should be reached but little is done for them now.

Some 500,000 children have or have had rheumatic fever, another disease that calls for long and expensive treatment. Only 25 States have been able to set up special programs for these children, and then only for a limited number.

About 1,000,000 children have defective hearing. Specialists in hearing defects are getting better results than ever before in their treatment of even very young children. But only 10 States now attempt to provide diagnostic and treatment service for these children.

About 4,000,000 children have visual defects. (A quarter of the 1,215 elementary school children examined in 1948-1949 in St. Louis, Mo., were found to need care of their eyes.)

Three-quarters of the children of school age have dental defects. Relatively few communities are providing topical application of fluorides for all children, a service which would reduce dental caries by at least 40 per cent.

How many children needing child welfare services are not getting them?

It is impossible to estimate how many children in the country are not receiving the child welfare services that they need. It is certain that there are many children in every State who need these services and are not now receiving them. We know that:

Only one out of every five counties now has a full-time child welfare worker paid from public funds. The greatest need in most States is for more child welfare workers in the counties.

About 50,000 and perhaps 100,000 children are confined in city and county jails each year. This is indicative of the great lack of adequate facilities for foster care of children who need detention or emergency care.

About 75,000 children are now being adopted each year. Although figures are not available, it is known that a substantial number of these children are placed through "black markets" in babies because of the lack of adequate child welfare services for unmarried mothers and for babies available for adoption.

Approximately 275,000 children come before the juvenile courts on charges of delinquency each year. In many communities there are not adequate child welfare services and facilities to provide these children the help they need in meeting the problems that have resulted in their being brought to the attention of the courts.

About 25,000 runaway children are dealt with by the courts each year. In many States there are not adequate provisions for protecting these children and returning them to their own States when this is to the best interest of the child.

Is not the shortage of trained workers one of the reasons why children must go without care?

It is, indeed. As a nation, we need many thousands more doctors, nurses, social workers, and other professional people especially trained in the care of children. We need many kinds of trained auxiliary workers to help relieve the load on highly trained specialists.

One of the major uses to which State agencies put Federal grants is in special training of workers. Under 1949 Federal grants, States budgeted $1,500,000 for the training of health workers, and $372,000 for the training of child welfare workers.

How will States use increased grants for child health?

Increased grants will be used to: (1) extend present services to reach more children; (2) do something for children with handicaps for whom there are no public services; and (3) train more workers.

How will States use increased grants for child welfare?

State child welfare agencies want to: (1) expand present services which are most inadequate in many places; and (2) develop new and badly needed services.

On what basis do States decide how their services should be expanded?

State agencies consult with private agencies and citizen groups which are acquainted with children's needs and with existing services under both public and private auspices. States take these resources into account in planning public services, both to avoid duplication and to encourage good teamwork between public and private services. The staff of the Children's Bureau is available to State health and welfare agencies to help them in planning expansion of their services.

How many more children can be helped with increased Federal funds?

Tens of thousands more undoubtedly will be helped, but it is impossible to predict any precise number. In the health field, for example, costs of medical and health services have been rising sharply in recent years, and may continue to increase. (Between 1939 and 1948, the average operating cost per patient in voluntary nonprofit hospitals rose from $6.42 to $14.06.) But as States provide health services for children with more difficult problems, the average cost of care may go up. The average number of days crippled children were cared for in hospitals in 1949 was thirty-eight, and in convalescent homes, ninety-seven days.

Preliminary estimates of how the States would use these funds indicate that public child welfare programs would be established in approximately 370 counties now without these services, and the total number of counties with full-time child welfare workers, paid from public funds, would be increased from 22 per cent to 33 per cent of the 3,183 counties in the country. Possibly 57,000 additional children would receive services under such an expansion.

American Academy of Science

The American Museum of Atomic Energy will be a part of the annual science exposition at the Cleveland meeting of the American Academy of Science Dec. 26 to 30, 1950.

Word has ust been received from David L. DeJarnette, Curator, that the American Museum of Atomic Energy, which is operated for the United States Atomic Energy Commission by the Oak Ridge Institute of Nuclear Studies, has completed all arrangements for an extensive exhibit in the arena of Cleveland's Public Auditorium, in conjunction with the AAAS annual science exposition. This exhibit will attract wide attention; part of it is a model of an Atomic Pile.

American Dental Association

An extensive program of entertainment has been planned for the ninety-first annual session of the American Dental Association, to be held from October 30 to November 2 at Atlantic City.

As a supplement to the scientific sessions, the clinics, the commercial exhibits, and the business meetings, there will be opportunity for well-deserved relaxation for A.D.A. members and their families at the nation's leading seaside resort.

Under the auspices of the Local Arrangements Committee, headed by Dr. Edward R. White, of Jersey City, a social calendar has been arranged that ranges from banquets and dinners to boat cruises, rides along the noted boardwalk, and a fashion show.

High light of the entertainment program will be the President's dinner in honor of Dr. Philip E. Adams, of Boston, Association president. The dinner will be held at 7 P.M. Wednesday, November, 1, in the American Room of the Traymore Hotel. Music and a variety of feature acts will be included on the program.

Owing to the limited capacity of the American Room, those desiring to attend are urged to make advance reservations for the President's dinner. Tickets will be $10 each and may be secured in advance from Dr. White, General Chairman, 921 Bergen Avenue, Jersey City, N. J.

On Tuesday evening, October 31, following the general session at the Traymore Hotel, the New Jersey State Dental Society will be host at an entertainment and dance open to all convention visitors without charge. The dance will begin at 10 P.M. and will be in the Carolina Room of the Chalfonte-Haddon Hall. Music will be provided by the famous Steel Pier orchestra headed by Alex Barthe.

Federal government dental corps chiefs will be special guests at a Federal government services luncheon at noon Tuesday, October 31, in the Traymore's American Room.

Among the guests of honor will be Admiral Spry O. Claytor, Chief of the United States Navy Dental Corps; Major General Walter D. Love, Head of the Army Dental Corps; Major General George R. Kennebeck, Chief of the Air Force Dental Corps; Dr. Bruce D. Forsyth, Chief of the Dental Division of the United States Public Health Service, and Dr. Bion R. East, Head of the Dental Branch of the Veterans Administration. Also invited to attend are members of the New Jersey congressional delegation. Advance tickets for the luncheon may be obtained for $4 from Dr. White.

The same day at 1 P.M. there will be a special program designed for families of the visiting dentists. A fashion show will be presented at a luncheon in the Chalfonte-Haddon's Carolina Room. Tickets are $4 and also may be obtained from Dr. White.

For visitors who are members of dental fraternities, the opening evening of the convention, October 30, will be devoted to fraternity banquets.

The American Dental Golf Association will stage its Calcutta Pool dinner Sunday evening, October 29, and its annual golf tournament on Monday.

Each day there will be boat cruises, bus rides to historic Cape May and to Seabrook Farms, and rolling chair rides on the boardwalk along the ocean's edge. There will be special rates, and arrangements for all rides may be made at the registration and information desks at the convention.

And, of course, there are always promenades in the invigorating sea air along the famous boardwalk.

Erwin D. Canham, editor of the *Christian Science Monitor*, will be one of the principal speakers at the ninety-first annual session of the American Dental Assoication, to be held from October 30 to November 2 at Atlantic City, it has been announced by Dr. Philip E. Adams, A.D.A. president.

A record-breaking attendance of more than 15,000 dentists and their families is expected at the four-day session, first to be held in Atlantic City since 1937. Ample housing accommodations have been assured for all visitors, it was reported by Dr. Edward W. White, of Jersey City, N. J., Chairman of the Local Arrangements Committee. Reservations are being handled by the A.D.A. Housing Bureau, 16 Central Pier, Atlantic City.

Mr. Canham will address the general meeting Tuesday evening, October 31, at the Traymore Hotel, where the House of Delegates and the Board of Trustees will also hold sessions. His subect will be "The Basic Challenge; An Editor Examines the Crisis of Our Time."

Mr. Canham, who has traveled extensively in Europe and the Far East in his 25-year career as a newspaperman, is a director of the American Society of Newspaper Editors and formerly served as its president. He is also acting chairman of the United States Advisory

Commission on Information to advise on the State Department's international information program. In 1949, he was appointed alternate United States delegate to the United Nations General Assembly.

Problems, of special interest to dentistry, created by the military emergency will be stressed at another event planned for the convention. Dental chiefs of the Army, Navy, Air Force, Veterans Administration, and United States Public Health Service will be special guests at a federal government services luncheon Tuesday, October 31, at the Traymore. New Jersey congressmen will also be present. Tickets are $4 and, because attendance is limited, they should be obtained in advance from Dr. White, at 921 Bergen Avenue, Jersey City.

Tickets may also be obtained from Dr. White for two other special events. One, top entertainment feature, is the President's dinner in honor of Dr. Adams to be held at the Traymore on Wednesday evening, November 1. Tickets are $10. The other is a fashion show and luncheon for women visitors at 1 P.M. Tuesday, October 31, at Chalfonte-Haddon Hall. Tickets are $4.

On the scientific side of the program, arrangements have been completed for an extensive array of sessions and exhibits, all to be presented at Convention Hall. There will be 77 essayists at 10 scientific sections, nearly 200 separate table clinics, a continuous motion picture program, and nearly 50 scientific exhibits.

Notes of Interest

Earl C. Bean, D.D.S., announces the new location of his office after Aug. 15, 1950, at 120 North Forsyth, Clayton Gardens, St. Louis 24, Mo., practice limited to orthodontics.

Gerard P. Bosscher, D.D.S., announces the opening of his office at 242 Jefferson Ave., Grand Rapids 3, Mich., practice limited to orthodontics.

James F. Dowd, M.D., wishes to announce the removal of his office to Suite 228, Beaumont Medical Bldg., 3720 Washington Blvd., St. Louis 8, Mo., practice limited to maxillofacial and plastic surgery.

T. M. Graber, D.D.S., Ph.D., announces the removal of his office to Suite 813, 122 South Michigan Ave., practice limited to orthodontics; North Side Office, 6961 North Greenview Ave.

Charles F. Mitchell, D.D.S., announces the removal of his offices to Suite 303, Bank of America Bldg., 101 East Philadelphia St., Whittier, Calif., practice limited to orthodontics.

Morse R. Newcomb, D.D.S., announces the consolidation of his offices at 13110 Shaker Square, Cleveland, Ohio, practice limited to orthodontics.

Dr. Murray A. Rice, formerly associated with Dr. Paul J. McKenna, Sr., announces the opening of his office at The Professional Building Annex, 21 Elm St. Worcester 8, Mass., practice limited to orthodontics.

Dr. Arthur C. Totten announces the removal of his office to 40 East 49th St., Suite 1701, New York 17, N. Y.

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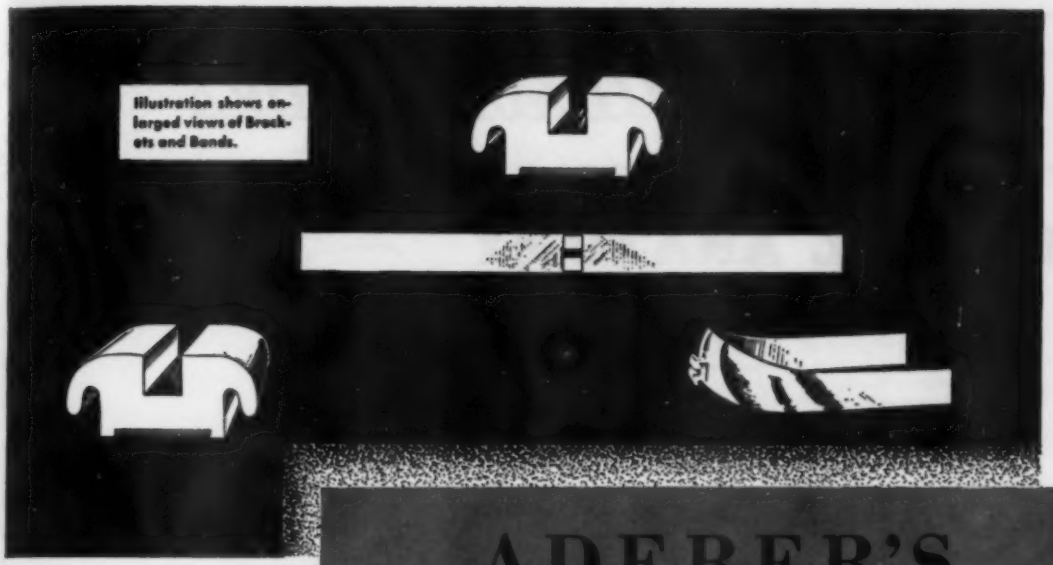

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A People's Partnership

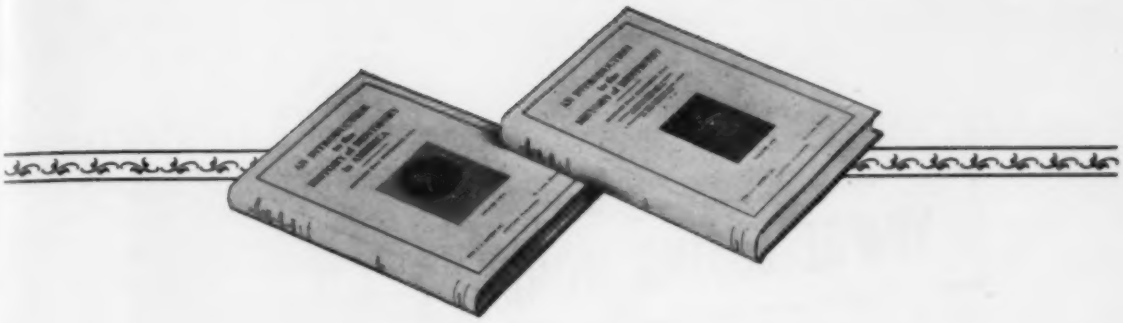
Community safeguards depend upon a united people. Especially in time of disaster efficient functioning is necessary if lives are to be saved and the injured and homeless given practical aid. That is why an organization such as the American National Red Cross is necessary. Haphazard planning won't do. People must know where to turn, how to coordinate their efforts to help.

The Red Cross was able to coordinate the services of civic groups in 1948 when more than 300 disasters struck in widely separated communities. Vanport, Ore., New Orleans, La., Coatesville, Ind., Greensboro, N. C., Bonne Terre, Mo., are many miles apart, but in each case the peculiar catastrophe that attacked these places was met by organized response.

All Red Cross work is divided between community volunteers and a full-time staff. Whether the work is educational and preventive, such as first aid, water safety, accident prevention, home nursing, nutrition; or remedial, such as aid to veterans, servicemen, and civilians, both hospitalized and able-bodied, the Red Cross counts on community cooperation.

The growing Red Cross National Blood Program particularly demonstrates the need for partnership that makes service possible. So far approximately 64,000 persons have offered to donate blood in this peacetime program, and blood has been distributed to more than 350 hospitals.

Let us continue to have faith in this people's partnership to the end that we will contribute our money, our time, and our moral support to make the 1950 Red Cross Fund campaign a success.



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Published by THE C. V. MOSBY COMPANY, 3207 Washington Blvd.
St. Louis 3, U. S. A.

Entered at the Post Office at St. Louis, Mo., as Second Class Matter.

Published Monthly, Subscriptions may begin at any time.

Official Publication of The American Association of Orthodontists, its components societies and The American Board of Orthodontics

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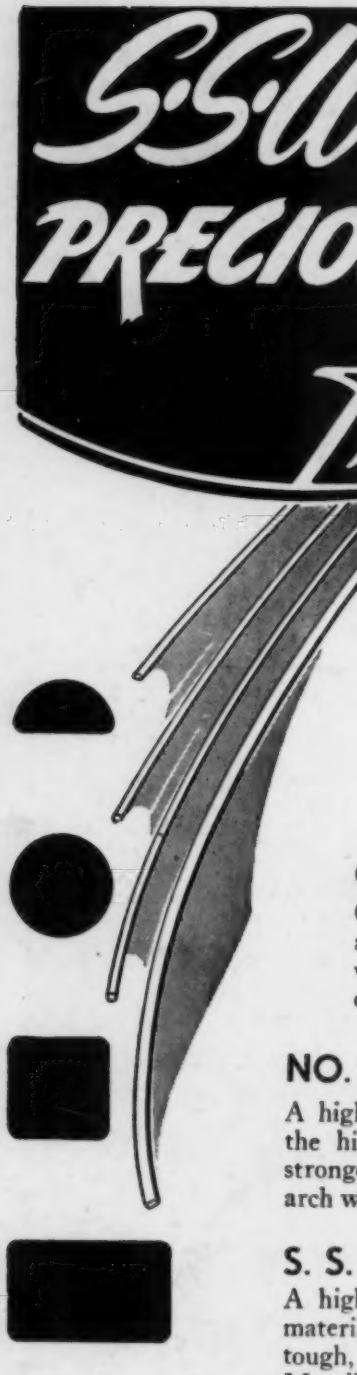

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